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THE MOUNTAINS AND KIBITKAS OF TIAN SHAN.

BY

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Since the completion of the Central Asiatic Railroad the interior of Russian Turkestan has become as accessible as the remoter portions of our own Southwest. Russian rule is firmly established, and the only difficulties are the inevitable ones which beset the traveller who journeys among the mountains or with Oriental servants. One day, for example, our capable head man, a Sart from Andijan, was told to buy some meat to be used to-morrow:

"Oh," said he, "that is unnecessary. God will provide meat when we need it."

"Yes, but he wants us to make what provision we can for the future."

"No, not at all," answered the Oriental, "this morning when we had no meat did not the Russian officer who is camped close by send us some? And when he had no bread did we not give him a supply? God will provide."

The difficulties afforded by the mountains are more formidable than those afforded by the people. Snow and ice frequently compel a change of route among the higher mountains, and the passage of rivers is often difficult. South of Son Kul Lake, for instance, the Narin River, one of the chief tributaries of the Syr, or Jaxartes, wanders over a broad gravel flood-plain in numerous channels which split and reunite again and again in a braided pattern. When we crossed the river during the first week in July an early start was wasted, for we had to sit down on the bank and literally let the stream flow by until its level was lower. The water of the river is largely derived from melting snow, and naturally the supply is

greater in the middle of the day than at sunrise after the low temperature of the night. The low water of a given sunrise gets to the Son Kul ford at from ten to twelve o'clock the following day. At nine o'clock the stream was low enough to allow a start. Nearly an hour was required to cross all the little channels into which the muddy river is divided. In the broad main channel we zigzagged up and down for more than fifteen minutes as the Kirghiz guide skilfully led the way from one gravel bar to another—now against the cold torrent, now with it, and sometimes even back a little toward the bank from which we had started.

In spite of, or perhaps because of, slight difficulties travelling among the Tian Shan Mountains during the summer is delightful. The journey, of which some results are given in this article, was made as a part of the work of the Pumpelly Expedition of the Carnegie Institution of Washington. Starting from Andijan, at the terminus of the Central Asiatic Railroad, in late June, 1903, Professor William M. Davis, of Harvard University, and myself made our way northwestward across the western end of the Tian Shan Mountains past Son Kul (Kul-Lake) to Issik Kul, where we separated, he to go north into Siberia, I south into Chinese Turkestan.

The physiography of the portions of the Tian Shan Mountains which it was our privilege to see has been described in reports published by the Carnegie Institution. In the Geographical Journal for December, 1904, I have attempted to show the relation between the main physiographic facts and the main ontographic or animate facts. In the present paper the same subject will be continued. The main physiographic feature of the western Tian Shan region is that the so-called mountain system is in reality peneplain, or region of low relief, with residual mountains of harder rock rising above it, which has been uplifted to an average height of ten or twelve thousand feet, forming a great plateau. The uplift was accompanied by warping which has divided the plateau into a series of basins and rolling bridges or uplands, none of which are as yet extensively dissected by the revived and encroaching rivers. Thus a large part of the western Tian Shan region consists of smoothly-floored basins and gently-rolling uplands lying at a height of from ten to twelve thousand feet and therefore subjected to a relatively heavy precipitation. The conditions of climate allow an abundant growth of grass, but no trees in the parts of the plateau which are free from snow during a few months in summer. Thus the first and most important result of the uplifted peneplain upon life is the vast plains of rich grass which the Kirghiz call the Sirt. The grassy

plains in turn influence animal life, including man. The climate is so cold, and snow lasts so long, that wild animals cannot inhabit the Sirt in great numbers unless they hibernate, like the marmot, or migrate, like birds; and even the latter cannot find food easily because of the scarcity of insects and of weeds with large seeds. Therefore animals are rare, although the conditions are almost ideal for herbivorous species during the summer months. Man has taken advantage of the favourable conditions, and brings his flocks of domestic animals to the Sirt every summer, returning with them to the warmer lowlands in winter. Nomadism is the only condition under which the human occupation of most of the Tian Shan plateau is possible. It is the main fact in the lives of the people, and determines not only their style of food, clothing, habitations, household economy, and commerce, but also their art, and their character as to industry, bravery, and hospitality, and even as to still higher moral qualities. The Kirghiz are so primitive, their manner of life is so simple and so closely bound up with their physical surroundings, and they are so little influenced by outside forces, that they furnish an unusually good example for the study of the influence of environment on human life.

The Migrations of the Kirghiz.—It is easy to see that the migrations of the Kirghiz are the direct result of their physiographic environment, and that their habitations and furniture must be such that all the household property can easily be carried from place to place. The effect of environment upon the character and manners of the people is harder to estimate, but must be equally real. The necessity that all should engage in the same sort of work in the presence of the others, whether rich or poor, develops the spirit of democracy and equality which is noticeable among the Kirghiz. The frequent movement from place to place and the contact with many people develop a spirit of sociability and hospitality. A description of some of the events of two days in early July, when we travelled from the Narin River up to Lake Son Kul, will illustrate these points, and give an idea of the daily life of the people.

From the ford of the Narin River an easy ride up a pretty mountain valley brought us to a group of kibitkas, or round felt tents, set in a green amphitheatre surrounded by steep walls of gray limestone. An unusually neat kabitka, so new as to be still white, stood apart from the rest, and had evidently been prepared for the foreigners at the suggestion of the Kirghiz who had of his own accord ridden ahead that morning to see that all was ready for our reception. The kibitka had been picked up bodily and carried to

a cleaner spot away from the unpleasant neighbourhood of the other kibitkas and of the flocks and herds. When a dwelling is to be moved a short distance a dozen men and women go inside, pick up the kibitka by the lattice-work fence which forms the framework of the lower wall, and, under the direction of a man on the outside, who acts as eyes for the rest, carry it blindly to the designated spot. It looks like an enormous beetle, walking across the turf with a dozen pair of human legs. The household goods which the kibitka had sheltered—the piles of rugs, felts, quilts, skins, boxes, bags, wooden bowls, and leather buckets—are left exposed in a sorry heap, which the women good-naturedly remove to another tent.

In the evening our Kirghiz village was in perfect order. In the centre of the valley ten or fifteen kibitkas were scattered on a fair green slope. On one side hundreds of stupid sheep were trying to push their way into the centre of the flock; on the other herds of neighing horses and stolid cattle were interspersed with camels—awkward two-humped beasts, strangely out of place among the lofty mountains, and ridiculous in felt coats put on to keep them warm. In the morning the village was in dire confusion. Kibitkas were lying in pieces on the ground with household goods strewn around them. A migration was to take place, and men, women, and children were busily making preparations. The slow-moving flocks of sheep had already been sent away at dawn, but the rest of the animals disported themselves among the ruins of the tents, waiting to be packed or ridden.

The men of the community were clad in big top-boots, black conical hats of heavy felt with brims of Astrakhan, and long quilted cotton gowns which had been wet so often as to appear dark and oily. Their chief business seemed to be to load the animals or to catch those which were still loose. When a horse was to be caught a man seized a pole like a fishing-rod with a loop of rope at the end and jumped bareback on a horse which was already bridled. Violent kicking and lusty shouting started both horses into a fine gallop, and it was sometimes half an hour before the loop was thrown over an animal's head.

The women wore heavy boots and quilted gowns much like those of the men. Many, however, had taken off the outer garment and were dressed in loose gowns of white cotton, or, in the case of the rich, of gorgeous silk, red, purple, and yellow. The sleeves of the garments of both sexes extend five or six inches below the hands and take the place of gloves as a protection against cold, especially in riding horseback. The head-dresses of the women, often a foot

high, are wonderfully constructed of fold after fold of white cloth wound into a cylinder. One fold hangs over the ears and under the chin in such a way that it can be drawn up across the lower part of the face, although this is rarely done. From below the huge head-dress the black hair hangs in braids, to the ends of which is attached a cord or piece of leather studded with silver. At the end of the cord, close to the woman's heels, dangle one or two silver rubles and the keys to all the family chests.

When a kibitka had been tied ready for packing, a tiny girl of six led up a camel ten feet high, and, in spite of the creature's horrible grunts and roars, made it kneel meekly as she twitched the rope fastened to a stick in its nose. The saddle of the largest, finest camel was decked with a long red fringe, which reached forward along the animal's curved neck to its head. When a load of pots, pans, boxes, felts, and parts of a kibitka had been tied securely, I saw a silk-gowned mother lay her baby in a wooden cradle without rockers. After covering it well, she tied one rope over its legs and around the cradle, and a second over its chest. Then in spite of its lusty crying she lifted the cradle unconcernedly to the top of the camel's load, lashed it on, and covered both baby and load with a large rug. Camels are not the only baggage animals, although horses are esteemed too highly to be often burdened with loads. It was no unusual sight to see a man on one side of a stout ox and a woman on the other, each with the right foot braced against the animal's side while they drew taut the ropes which bound the load of kibitka poles. A monkey-faced dog slunk behind one such pair, while close by a girl of ten in figured red and purple silk waited to be helped on her horse. Beside her a tiny imp of three stood motionless, his round, astonished face, long gray dress, and funny high boots sinking into insignificance under the immense dome of black sheepskin which served as a hat.

At last, when all was ready, we started on a delightful ride up a steep gorge, where the road zig-zagged among fine spruce trees, the first that we had seen. A Kirghiz migration is a sight which never grows monotonous. First we passed a man on a cow, then a heavily-loaded camel with two small boys perched high on top of the load and two ridiculous baby camels, too small to carry even a roll of felts, running awkwardly in the rear. Next two fat cows, with wooden rings in their noses, walked placidly along with loads of straw-matting and poles. In front of them an old gray-beard with a black hat and a wadded gray gown rode proudly on a spirited horse. His gloved right hand rested in a wooden crotch supported

by a little stirrup, and on his wrist was perched an eagle, with a leather hood over its eyes. Behind the man stood a four-year-old urchin, a miniature of his grandfather, his feet planted sturdily on the horse and his hands firmly grasping the old man's shoulders. Ahead of this pair a ragged lad, mounted bare-back on a yearling steer, jogged along contentedly behind a herd of horses and colts. In spite of his rags he looked happy, well fed, and warm. So, too, did all the people on that day's march; and, indeed, all the pastoral nomads whom I have ever met seemed to be comfortable. When their flocks diminish and they grow poor they are obliged to betake themselves to agriculture, leaving only the rich to continue the nomadic life.

When we crossed the pass at the head of the valley and entered the basin of Lake Son Kul, 10,000 feet above the sea, the scenery suddenly changed. From the contracted limits of a young steep-sided gorge we suddenly emerged into the mature topography of a gently-sloping green country full of marshy places and of brooks which ran half hidden among the grass. We had passed from a young valley of the present cycle of erosion into a basin where the ancient topography is largely preserved. Although the season was early July, bits of fresh snow lay a few hundred feet above the lake, and the soft turf was thickly set with the flowers of early spring. Rain fell almost daily while we were in the neighbourhood, and there were frosts at night.

The basin of Son Kul is the favourite pasture-ground for the Kirghiz of a large district. When the snow disappears in the middle of June they bring their cattle and sheep to feed on the rich grass and remain in the neighbourhood till snow comes again in September. Every two or three weeks each camp is moved a few miles to a fresh spot, both for the sake of new grass and for cleanliness. The summer months are the social season of the Kirghiz. The comparatively well-to-do people who come to Son Kul migrate to the lake from every direction. As each group of relatives pitches its camp where it pleases, and as the location of the camps is often changed, people from all parts of the country become acquainted with each other. The men invariably have plenty of time to talk and drink tea; the women work more steadily, but nevertheless have time for visiting, and one occasionally sees parties of them making calls on horseback.

The Effect of Glaciers and Glaciation on Physiographic Forms.—Under the present climatic conditions of Turkestan, glaciers are of small importance in their effect on life of any kind. So far as

man is concerned, their chief importance is that their presence or absence determines the location of roads, and certain regions which might furnish good summer pasturage are left untenanted because of the difficulty of driving flocks across the surrounding glaciers. The more extended glaciers of the past, however, and the climatic changes, of which the glaciers were the accompaniment, have produced physiographic features which are of great importance in the life of the Kirghiz of to-day.

These features divide themselves into three types: First, ancient moraines at the heads of the higher valleys; second, terraces along the middle portions of valleys at the heads of which glaciation may or may not have taken place; and third, extinct lakes at the lower ends of streams which terminate in closed basins. The formation of lakes and of moraines needs no explanation; the terraces are not so generally understood.

The valleys of Turkestan and of other portions of Central Asia are almost invariably terraced. The terraces are of three kinds, differing in composition, but apparently due to the same climatic cause. The first type of terrace is cut partly in rock and partly in a cover of stream-laid gravel, and is found among steep young mountains where the streams are actively deepening their channels without wandering much from side to side. The second type is cut wholly in stream-laid gravel, and is found in valleys which are still young, but have reached the stage where the streams begin to broaden their channels as well as to cut downward. The third type is cut in stream-laid gravel lying unconformably upon fine silt, and is found among mature mountains, especially in very arid regions. It has generally been assumed that such terraces as those of Turkestan are due to warping of the earth's crust, but this explanation is unsatisfactory. The terraces occur with such uniformity of type and number in widely-separated regions, and in valleys which interlock so intricately that, if they are due to warping of the crust, the warping must have been of identically the same rhythmic type over an area extending at least twelve hundred miles east and west, and eight hundred north and south. Yet the warping must have been so adjusted to the minor features of the earth's surface that it caused similar acceleration or retardation of the streams in all the valleys, no matter in which direction or to what destination the water flowed. Such a warping of the earth's crust is contrary to what we know of the nature of earth movements in other places, and is practically impossible. Accordingly, we are forced to conclude that the terraces are due to the climatic

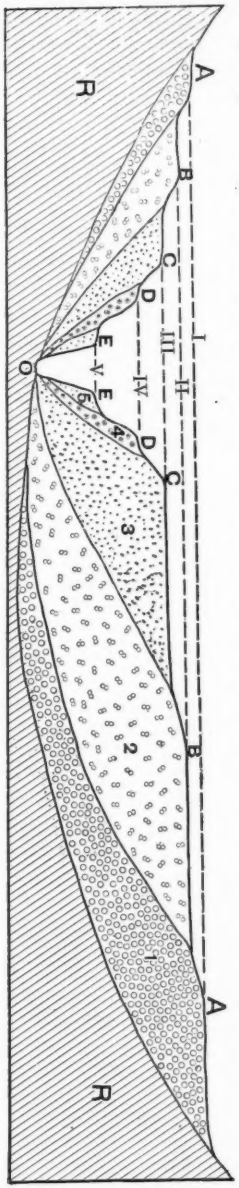

FIG. 1.—IDEAL CROSS SECTION OF THE TERRACES OF THE KUGART VALLEY.

A, B, C, D, E: Terraces. — I, II, III, IV, V: Levels to which the valley was filled with gravel during successive glacial epochs. 1, 2, 3, 4, 5: Gravel fillings of the glacial epochs. — R: Bed rock.

changes which took place in Central Asia during the Glacial Period, as is proved by ancient moraines and extinct lakes.

The formation of climatic terraces seems to be due to the fact that during glacial epochs the rate of weathering of the rocks was more rapid than during interglacial epochs. In this way the streams coming from young mountains, with slopes so steep that they could not possibly become graded, were heavily loaded, and compelled to deposit the coarser part of their loads. The deepening of the channels was checked, and the streams began to cut laterally. When a dry epoch ensued the streams returned to their former condition. The deposits of gravel were dissected and terraces were formed, consisting wholly of gravel if the streams during the drier times were in a graded condition (see Fig. 1), or of gravel overlying rock if the streams were in the condition of active vertical erosion. In regions where the mountains are mature and the climate is normally arid, the rock slopes of the mountains are ungraded and naked during interglacial periods, but become graded under the moister conditions of a glacial epoch. On the return of drier conditions, however, the loose soil and rock fragments which have accumulated during the previous epoch are washed away because of the drying up of the vegetation which held them in place. The

streams are thus heavily loaded, and are obliged to deposit part of their load upon the fine flood-plain deposits of the preceding epoch. Soon, however, the loose materials upon the mountain sides are washed away entirely, and the load of the streams is limited to the relatively small amount of detritus derived from weathering under arid conditions. Under such conditions the load is not equal to the capacity of the streams, and the latter begin to erode and deepen their channels. Thus terraces are formed, the upper part consisting of gravel, the lower part of the finer deposits of the previous flood-plain. A repetition of the terracing process during successive pairs of glacial and interglacial epochs causes a series of terraces in each valley. The diagram (Fig. 1) illustrates how this takes place in the case of a valley where the terraces are composed wholly of gravel. At the beginning of the first terrace-making epoch the stream may be in any part of the valley, and the terraces on the two sides may be of very unequal width. In some parts of Turkestan the terraces form broad plains, elsewhere they are reduced to narrow strips. Their number is usually from three to five, although sometimes they all disappear; while at other times the number reaches six, or even seven. Occasionally they are connected with moraines at their upper ends, or with lake terraces at the lower ends, showing that they were in process of formation at the same time as the better-known features which characterize the Glacial Period.

The Effect of the Glacial Period on Human Life.—The effect of the Glacial Period on human life may be divided into two parts —namely, the results due to physiographic features produced by the climatic changes of the Glacial Period and still directly operative; and the direct results of the climatic changes upon ancient man, now operative only indirectly through heredity. Of the latter almost nothing is known, although a few phenomena, to be mentioned later, suggest that even during historical times the climate of the Tian Shan Mountains may have been different from now, although far from being what is usually understood by the term "glacial." The physiographic features due to the climatic changes of the Glacial Period have already been classified as moraines, terraces, and extinct lakes. Their influence upon life is secondary to that of the plateau character and climate of Tian Shan, but, nevertheless, it is one of the factors which have helped to determine the present condition of life, both animal and vegetable.

On the whole, the Glacial Period has produced results which are

beneficial to the human inhabitants of Tian Shan to-day, however disagreeable they may have been to the people, if any, who were obliged to endure its rigours. In the first place, the roads are better because of the Glacial Period. Near the heads of the streams flat-floored glacial valleys form broad, easy approaches to the high passes, quite different from the narrow, inaccessible gorges which would otherwise exist, and which do exist, in many cases just below the limit of glaciation. The moraines, too, with the exception of the younger ones, furnish easy locations for roads, in spite of the fact that their topography is irregular. Farther down stream the terraces supply ideal locations for roads, and one can often travel for miles without any of the hindrances which are met in ordinary mountain valleys, and which are abundant in Tian Shan as soon as one reaches a place where the valley is so narrow or the stream has swung so far to one side that the terraces are wholly consumed. In such cases the roads must wind up and down over rugged and precipitous rocks. One realizes at once that if the roads were everywhere as difficult as in these places where the effects of the Glacial Period have been obliterated, the migrations of the Kirghiz would be much more arduous, and therefore, it is safe to say, less frequent.

In the next place, because of glaciation, the valleys are more productive. The bottoms of the glaciated troughs in the higher mountains are smooth and broad, and rich grass grows where nothing but stones would be found in an unglaciated country. The smoothly-graded hills and hollows of the old moraines also furnish the best of summer pasture for the flocks of the nomad Kirghiz. So true is this that one acquires the habit of looking for a group of tents as soon as he encounters a well-weathered moraine. Lastly, the gently-sloping plains of the terraces provide ideal sites for winter villages, especially where neighbouring mountains furnish abundant water for irrigation and are easily accessible for the summer migrations. Fine examples of all these features are found in the Alai region, which lies south of the Tian Shan plateau, but is of the same type physiographically and ontographically. One of the most attractive "yailas" or summer camps of the Kirghiz that I have seen was in the hanging valley of Bursundu, at the west end of the Alai Valley. From the broad glaciated valley of Kok Su, with its moraines and cultivated terraces, a rough narrow gorge led up to a small moraine, above which was the smoothest and greenest of flat-floored valleys. Horses, sheep, camels, and cattle grazed peacefully among the dark-gray kibitkas which dotted

the rich sod. A brook of the clearest, coldest water formed a thin black line as it twisted and wriggled this way and that among the overhanging turf, as though loath to leave the pleasant verdure and enter the naked gorge. Not far from Bursundu the moraines of the Alai Valley are equally beautiful during the warm season. As one rides among them in the fresh mountain air there is a sense of space and freedom, and the varied topography furnishes a continual incentive to move on. From one grassy hill-top a new pond appears, from another a herdsman mounted on a yak and following a flock of sheep, or a kibitka with a group of women sitting outside it and making the coloured felts which are so prominent an article of Kirghiz housekeeping. Farther down the valleys the terraces are scarcely less attractive. At the village of Jekendy a broad terrace plain is covered with heavy crops of the hardier grains and of grass. Scattered here and there are houses of mud, the flat roofs of which are hidden under huge stacks of hay stored against the winter, when the glacial valleys and moraines must be abandoned and the flocks must be brought to winter quarters. Overlooking and encircling the haunts of the Kirghiz, the mountains rise grandly into peaks whose beauty is enhanced by the glacial carving to which they have been subjected. Their subtler influence joins that of the glacial troughs, the moraines, and the terraces in making the life and character of the Kirghiz distinctly different from what it would be if there had been no Glacial Period in recent geological times.

The Salt Lake of Shor Kul.—The terraces which surround the salt lake of Shor Kul, eighty miles northeast of Kashgar, prove that during the Glacial Period the lake was more extensive than at present. To-day it is a small body of water, about ten or twelve miles east and west by two or three miles north and south. Shor Kul means salt lake; and the name is eminently deserved. I saw it in August, 1903, during a time of unusual rains. The water was so full of salt that it resembled a New England pond which had been frozen clear to the bottom and was now flooded by a March thaw. On the borders, black, ill-smelling muck dipped under the water so gradually that it was impossible to say just where the lake began. Out over the lake the dull gray of the lifeless brine was broken only by two or three little green islands a mile or two away, and by a salt gathered far from the shore. With his great hoe the man scooped up a mass of salt crystals mixed with mud. Then with a skilful twist he rinsed the salt clean, and poured it into one of the bags on the back of the patient wet donkey which was to carry it to market at Kashgar.

Between the shore of the modern lake and the abandoned ancient shore-line lies a plain, mostly swamp, which may justly be regarded as a product of the Glacial Period. It is composed of yellowish clay silt caked with salt, and is merely the dry bed of the lake of glacial times. On one side the lake presents a lifeless expanse of brine; on the other the country is composed of broad stretches of subangular gravel devoid of vegetation, except a few bushes and a low, sweet herb. Between these two desert regions, however, the ancient lake-bed itself is full of vegetation. On the drier edges the vegetation consists chiefly of low bushes with a profusion of insipid berries, resembling the huckleberry in appearance. In other places, where the plain is smoother and better-watered, vegetation is luxuriant, and the country is what is called a swamp. Often the surface is dry for months; but it is inundated at certain seasons, and there is always water below. The most abundant plant is the feathery tamarisk, with its spikes of beautiful pink flowers turning to delicate shades of red and brown as they grow older. Between the tamarisk bushes tall reedy grasses, with edges which cut like knives, sprout abundantly, and are interspersed with weeds bearing yellow and purple flowers. Occasional springs form the centres of turfy marshes, where the fresh water of the springs washes away the salt and permits the growth of ordinary grass. In many places the swamp is diversified by low hills or flat tables several miles broad, rising twenty or thirty feet above the swamp. Their greater elevation causes them to be covered with a less dense growth of tamarisks and grass, which are in part replaced by berry bushes and knotty poplars resembling the cotton-wood. The trees stand from twenty to a hundred feet apart, with many bushes and dead trees between them. The scenery has an open pasture effect, which is very pleasing. Even in the swamp the views of waving tamarisks and bright flowers are pretty, even if limited and unvaried.

The springs of the Shor Kul swamp have the remarkable habit of frequently appearing upon hills. At the village of Jai Tepeh, for instance, the hospitable Minbashi, or headman, took me at once to view the wonder of the village, the five springs of sweet water which well up on the sides of a little hill about twenty-five feet high. For miles around there is a smooth plain with very few springs, but here on the hill the water bubbles up with considerable force, and the same thing occurs in several other places. The hills are composed of gravel or sand; the plain of fine clayey silt. During an interglacial epoch, or before the Glacial Period, the coun-

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try appears to have been so dry that sand and fine gravel were deposited subaerially, forming a plain at the level of the present hill-tops. Under changed conditions the plain was thoroughly dissected, leaving only hills and low plateaux. Next the lake rose during a glacial epoch, and the sand and gravel were covered with clayey silt, which is impervious to water. The hill-tops, however, were not covered with silt, or were so thinly covered that the underlying coarser material was soon exposed once more after the retirement of the water. Now rain-water and the drainage of the mountains enter the gravel at A, Figure 2, and flow easily through

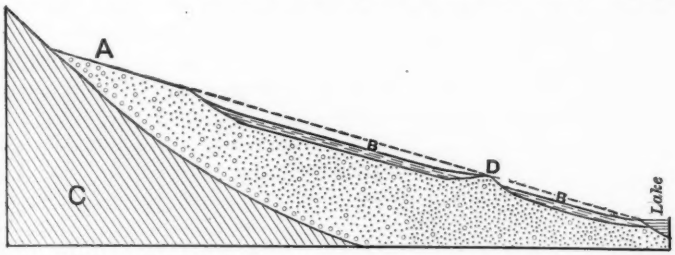

FIG. 2.—CROSS SECTION TO ILLUSTRATE THE SPRINGS OF THE SHOR KUL SWAMP.

the relatively coarse material of the subaerial deposits, but cannot get out through the impervious clay, B, above, or through the rock beneath (C). Finally the water reaches a little hill such as D, where the clay is either absent or dissected, and, being under pressure, bubbles up in a natural artesian well.

From the foregoing description it appears that the swamp of Shor Kul, with its peculiar vegetation and its unusual springs, is due to the changes of climate which took place during the Glacial Period. An indirect effect of the changes can be seen in the influence which the swamp has had upon the human inhabitants of the region. The people of Shor Kul are Kirghiz who settled there a few generations ago, coming from the north from the plateau of Tian Shan. They are of precisely the same stock as their mountain neighbours, and, so far as I know, have been exposed to the same conditions, with the exception of those which pertain to the character of the country which they inhabit. Accordingly, unless the people of Shor Kul were originally different from those of Tian Shan, it is a fair inference that any differences which now exist are due to present environment. The people of Shor Kul are under Chinese rule, and those of Tian Shan under Russian, but it is not probable that this has as yet produced any marked

effect. Moreover, part of the Tian Shan Kirghiz are under Chinese rule; but they do not seem to differ greatly from their neighbours, although, on the whole, they appear poorer, and possibly somewhat more suspicious and less hospitable.

The Kirghiz of Shor Kul still consider nomadism the ideal life, and some of the richer members of the community go to the mountains. The majority now spend all the year at Shor Kul; some of them living always in one place, others moving about within a very circumscribed area. The round kibitka is still used, but houses of mud are more common, and are inhabited even in summer, which is rarely the case among the true nomads of the mountains, even though they have houses for winter use. One reason for the greater use of houses at Shor Kul may be the mosquitoes, which are innumerable, especially near the springs, where of necessity the villages must be located. There is less life and movement among the people and less travelling from place to place, partly, perhaps, because the roads in the swamp are exceedingly muddy whenever it rains, and locomotion for such animals as sheep is almost out of the question. With the tendency to a more sedentary life, and perhaps because of it, there come a greater curiosity, a greater tendency to stand and stare at every act or gesture of strangers. The Kirghiz of the mountains are interested in seeing strangers, but they are polite in their way of manifesting their interest. Hospitality is still a virtue of the people of Shor Kul, but it is less spontaneous than among their cousins of the mountains and more restricted to men of influence. It is a necessity among people who travel much, but becomes a luxury among those who usually stay at home.

Since the Kirghiz came to Shor Kul it is hard to say whether industry has gained or lost. Everywhere the Kirghiz are lazy, according to Occidental standards, although they work with remarkable energy at times. At Shor Kul agriculture is more important than elsewhere, and requires more steady application to work than does the care of flocks. The number of animals owned by the sedentary people is naturally less than among the nomads, and the kinds are different. Donkeys, which the nomads despise, are freely used at Shor Kul; but camels are rare, because the mud is often so bad that they are helpless. Sheep, too, are less abundant, and naturally the amount of meat and milk consumed is far less than among the mountains. Yet, in spite of changes, old customs persist with great tenacity. The nomad in the treeless mountains is obliged to resort to dried dung for fuel. The people of

Shor Kul preserve the same habit, in spite of the fact that there are hundreds of trees, many of them dead and fallen, within a few miles of the villages, and although dried dung is a very inconvenient form of fuel, and produces a most disagreeable smoke.

Perhaps the most marked result of the partial change from a nomadic to a sedentary life is the lessened freedom of the women. Among the nomads, one sees them continually engaged in their household tasks. They converse freely with the men, and make no attempt to keep themselves hidden. At Shor Kul, on the other hand, wherever permanent houses have become the rule, they remain for the most part within doors, and when obliged to be out of doors take evident pains to avoid the gaze of the men. They are beginning to fall into the deplorable condition of women in other Mohammedan countries. It is hard to say to just what extent the differences between the Kirghiz of Shor Kul and of Tien Shan are due to differences of environment; but it is at least worth noticing that where the Glacial Period caused the formation of the extinct lake of Shor Kul, and thus produced unusual physiographic conditions, the people who have for a few generations been subjected to the new conditions begin to show changes in their method of life, and even in character.

The Lake of Issik Kul.—The most important lake of Turkestan is Issik Kul, a sheet of water one hundred and ten miles long from east to west, and from eight to thirty miles wide. It lies at a height of 5,180 feet above the sea, in a region of rainfall so moderate as not to allow of agriculture without irrigation. On either side rise snow-covered mountains to a height of 14,000 feet or more. The traveller who expects to find a genuine mountain lake, however, will be disappointed, at least if he approaches from the west end, as we did. Issik Kul, like most of the lakes of Asia, is smaller than formerly, and lacks the beauty of a body of water which fills its basin to the brim.

Leaving the half-buried spurs of the block-fault mountains on the southwestern border of the Issik Kul basin, one emerges upon a broad stretch of piedmont gravel, much of it rough, angular, and shining black with "desert varnish." Lakeward the gravel passes into silt covered with bushy vegetation, and, finally, two or three miles from the base of the mountains the lake is bordered by a tract of marsh. The silt between the gravel and the marsh is utilized by the Kirghiz for their primitive agriculture. The system of irrigation is extremely crude; and the fields of peas, wheat, and barley are often so weedy that one is puzzled to know where the

cultivated land begins. In summer, part of the Issik Kul Kirghiz migrate to the mountains, and part to the marshy lands along the lake shore. In each village two or three of the poorest men are left to tend the irrigation canals. The villages themselves are merely scattered collections of cattle yards, surrounded by walls of mud and brush, inside which the kibitkas are pitched in winter. The people of Issik Kul are less purely nomadic than some of the Kirghiz, but they do not show the tendency to change which we have found at Shor Kul.

The western portion of Issik Kul is uninteresting, and the flat shore forms smooth, unbroken curves. Toward the middle of the lake, however, the bands of marsh and of silt described above disappear, the smooth slopes of naked gravel are covered with green fields and trenched by small valleys, and the bold shore becomes sinuous with high promontories and pretty bays. Farther east, the shore-line becomes still more irregular, and is characterized by long finger-shaped fiords, which indicate that the region has been depressed so that the valleys are drowned. Instead of the dull scenery of the western end of the lake, or the pretty but not unusual views of the central portions, the eastern end possesses a unique and unexpected beauty. A mile or two from the water one enjoys a pleasant prospect of smooth, green plain, fertile, well tilled, and dotted with the villages of lately-arrived Russians, or with lines of ancient mounds running nearly north and south. Suddenly, however, the plain is broken by a deep fiord, a lane of water between steep green walls from fifty to two hundred feet high. The limited but wonderfully beautiful scenery of the fiords is in utter contrast to the broad views of green plain, white mountains, and blue lake which lie just above. The little bays, the bushy shores, the long, winding pathways of clear water, and the waterfowl which fly up from lake or marsh entice one onward against his will to see what new beauty lies concealed. The cause of the marked difference between the two ends of Issuk Kul is that in recent geological times the whole region has been tilted up on the west and down on the east, so that at the western end the uninteresting lake bottom is left exposed, while at the eastern end the valleys have been drowned and beautified. To-day the monotonous western end is left to the Kirghiz, but the attractive eastern end is the seat of several Russian colonies, chief among which is the prosperous little town of Przhevalsk. Agriculture seems to thrive, although the climate is so cool that at the end of July I found strawberries just ripening.

Issik Kul has been subject to changes of level. Two changes took place before the lake was tilted, and are recorded in two high terraces beside the outlet. It is possible that the terraces record a double rise and fall of the lake during two epochs of the Glacial Period, but no certain conclusion can be reached, because of the peculiar character of the lake's outlet. After the tilting the first position of the lake of which we have certain knowledge was about thirty feet higher than to-day, where the water stood long enough to form a well-defined beach and bluff. Along the flat shore of the western end, the thirty-foot beach is an insignificant line of sand, below which are smaller ridges of sand marking stages of retreat. Behind the ridges are lagoon-like strips of marsh. The present beach is a sand ridge of the same sort, often with a reedy lagoon behind it. Where the lake shore begins to be drowned the old beach is much more prominent. It appears like a railroad grade forming a flat-topped ridge across the mouths of valleys or a cut along the ends of spurs.

Mankind probably occupied the eastern shores of Issik Kul previous to the rise of the lake to the thirty-foot level. Fourteen miles east of the Russian village of Sazanovka, an artificial mound stands directly on the edge of the bluff which marks the old shore-line. The mound is of unknown age, and, like the other prehistoric mounds of the region, consists of granite cobblestones from five to twelve inches in diameter, piled in a circular wall and covered with loam. It is of small size, about a dozen feet high, and thirty feet in diameter. About a third of the mound on the lake side has been cut away, and the boulders lie scattered at the foot of the bluff. It is probable that the mound was built during or before the time when the lake stood at a high level, and was located so close to the shore that in course of time the waves undermined it. There is a possibility that it was built on the very edge of the bluff after the water had retired, and that it has since been worn away by ordinary erosion. This is unlikely, however, because of the smoothness with which the line of the bluff extends across the middle of the mound, and because of the lack of debris at the base of the latter. The lake could carry away the debris and preserve the smoothness of its shore-line, which would be impossible for ordinary erosion. A single case like this leads to no definite conclusion, but it suggests an interesting field of investigation in the relation of Issik Kul to early man.

Son Kul affords another suggestion of the way in which physiographic conditions may have varied since the advent of man. On

the mountain sides, at a height of from 10,000 to 10,500 feet above the sea, we found the remains of a number of large irrigation canals. They must be hundreds, possibly thousands, of years old, since they are thoroughly graded, and are sometimes wholly obliterated for a space. They cannot be of extreme age, however, for many can still be traced throughout their entire length, although they lie across slopes of considerable steepness, where erosion is so rapid that such small features must soon be eradicated. They must be irrigation canals, for they contour around the hills, are broad enough to carry most of the water of the streams from which they diverge, and come to an end in places suitable for fields. The peculiar feature is that they lie at a great altitude, where there is now no agriculture, nor could be, it would seem. Snow falls at Son Kul, so the people say, during all but two months of the year. On the morning of July 8, at the altitude of the upper canals, I walked on new snow which was said to have been a foot deep a few days before. Next morning, near the shore of Son Kul, below the level of the fields watered by the canals, the ground was stiff with frost, and the little pools on the edges of the brooks were skimmed with ice. Moreover, if agriculture was possible under such conditions, irrigation seems unnecessary. In July the ground was saturated with moisture, and the natives told us that the grass is always as green as when we saw it. The simplest hypothesis is that at some time since the human occupation of the country the climate was warmer, and therefore drier than now, but this cannot be proved. In regions such as Transcaspia and Persia, there is strong evidence of a greater water supply during antiquity. It is hard to reconcile the two sets of facts, but it may be that climate is more changeable than has been supposed, and that since the dawn of history man has passed through more than one change between colder and warmer, or moister and drier conditions. If this has been the case, the course of history must have been deeply affected by geographic causes as yet uninvestigated.

THE WESTERN SIERRA MADRE OF THE STATE OF CHIHUAHUA, MEXICO.

BY

EDMUND OTIS HOVEY.

The region comprised in Western Chihuahua, eastern Sonora, and southward in Mexico along the zone of mountains known as the Western Sierra Madre is practically a terra incognita to geologists and geographers. It includes the region left uncoloured on Costillo's geological map of Mexico as being unknown. Here and there mining engineers have examined bits of property for individual or corporate mine owners; but their reports rarely contain any structural data, and are seldom published in journals. The archæologist has penetrated into some of the mountain fastnesses, but he has given us scarcely a glimpse of the physiographic wonders of the region. No correct map of the mountains and rivers is in existence; but the railroad surveys now under way, in the effort to connect the high plateau with the Pacific coast region, should ere long furnish us with valuable data for one.

With the prospect, therefore, of traversing virgin territory, Professor Robert T. Hill and the writer* turned their faces toward the Southwest last winter, and spent several weeks in a remarkable series of cañons and mesas which will be described in a summary manner in the present communication, which gives some of the results of our joint observations. Our route led us southwestward across the Chihuahua desert province over the new Rio Grande, Sierra Madre and Pacific Railway to its present terminus at Nuevas Casas Grandes, Chihuahua, about 150 miles from El Paso, Texas, and from the very beginning the journey was suggestive.

The stratified beds of the arid and semi-arid regions of western America have given rise to much discussion as to their origin. Great lakes have been assumed to account for the extensive terraces, but it is difficult to conceive of the permanent or even protracted existence of large bodies of water under the conditions obtaining in the region. The cycle of the "mesa," or desert, formations was made clear by this little railroad journey across the arid bolsons to Lake Guzman and thence up the Casas Grandes, or

* The latter as the representative of the American Museum of Natural History.

San Miguel River. Under the influence of the great diurnal changes of temperature of the elevated plateau, and consequent expansion and contraction, the volcanic materials making up the mountains crack and disintegrate. The fragments as they descend the slopes become smaller, and soon come within the transporting power of the heavy winds which often prevail upon the plateaux.

The broken-down material is rapidly carried into the basins which lie between the numerous old centres of eruption and gradually fills them. From time to time the water collects in these depressions, and more or less temporary ponds are formed, which act like settling tanks—a term suggested by Professor Hill. Well-stratified beds thus originate within the wind-drifted areas and between beds showing little or no stratification. This explains the occurrence of some of the lenticular deposits of adobe clay in the strata composing the mesas. Robert T. Hill and others have written much upon the geology of desert and arid regions, but this explanation of the origin of some of the adobe clay deposits seems to have been overlooked.

The particular feature of the copious drainage of the high plateaux of the Western Sierra Madre is that most of the streams either dry up in the desert or flow into lakes which have no outlet. The Conchos, however (a tributary of the Rio Grande), is slowly working its way back toward the high plateau from the east; while the Yaqui and its branches, the Mayo and other Pacific rivers, are cutting into the plateau from the west with greater rapidity.

Lake Guzman, eighty miles from El Paso, is one of the largest of the desert lakes. It is 25 miles long and from 10 to 15 miles wide, and the evaporation from its surface is said to amount to seven feet per annum. The lake is reported to have been entirely dried up in August, 1904. The principal stream flowing into Lake Guzman is the Corralitos, or Casas Grandes River, and we followed this nearly to its source. Like other streams flowing into deserts, the maximum volume of this river is not near its mouth, but is near its entrance into the region where evaporation equals or exceeds precipitation.

The river which is known as the Corralitos for part of its course and the Casas Grandes for the rest is formed by the union of the San Miguel and Piedras-Verdes Rivers about ten miles south of the town of Casas Grandes, which received its name from neighbouring extensive prehistoric ruins. The San Miguel is the principal of these tributaries, and should give its name to the whole river, or

else the name Corralitos should be applied to the whole, the name Casas Grandes not being sufficiently distinctive on account of other regions of extensive ruins in Mexico. Many rivers in Mexico are known by different names in different parts of their courses—a practice which leads to much unnecessary confusion in geographic nomenclature.

Most of the mountains in sight from the railroad are volcanic in origin, but the Sabinal Mountains, about 100 miles from El Paso, are granitic in character, overlain by "porphyry" and by limestone of Cretaceous age. This is the location of the San Pedro group of silver and lead mines. Advancing southward from the end of the railroad as far as the Aros (Yaqui) River, 80 miles in an air-line, the rocks are almost exclusively volcanic, mostly rhyolite and andesite and their accompanying tuffs and dikes, together with comparatively local sandstones and conglomerates which have been derived directly from the volcanic materials and which represent ancient mesa and fresh-water basin formations. East of Hacienda San Diego blue limestone, probably of Cretaceous age, occurs in the foothills, and is quarried on a small scale for burning into lime.

About fourteen miles south of San Diego we began our ascent from the Chihuahua desert to the high plateau by way of the San Miguel cañon, and followed up its winding course for ten or twelve miles. The river is in a period of rejuvenation, and cuts a narrow, deep gorge 300 to 500 feet deep in a well-dissected plain which rises gradually to the cliffs forming the walls of the outer or upper cañon. The whole cañon is six or seven miles wide and about 1,800 feet deep. The principal rocks exposed are rhyolite flows and tuffs, but basalt occurs at the northern end of the cañon, and rounded andesite hills are under the rhyolite cap toward the south. The scenery is varied and beautiful.

Following the Arroyo Metate and another great ravine without a name, we climbed out of San Miguel cañon, and came upon the great plateau at 6,500 feet,* after passing over the outer rim of the cañon at 7,200 feet above the sea. The plateau is divided up into great haciendas or cattle-raising estates, the most valuable portions of which are immense nearly level plains or basins, most of which have no drainage outlet. The extensive plain, or prairie, known as the Llano Cristo forms a portion of the San Miguel hacienda, one of many belonging to General Luis Tarrazas, Governor of the

* All the elevations given in this article were determined by means of an aneroid barometer.

State of Chihuahua. The plateau is a constructional plain formed by the upper surface of rhyolite flows, with its hollows partly filled by the wash from the higher portions.

FIG. 1—YAQUI (ARÓS) CAÑON, NEAR GUAYNOPITA RIVER, IS 5,200 FEET LOWER THAN DISTANT RIM. INNER GORGE ABOUT 2,000 FEET DEEP.

The surface features of these plains would form an interesting topic for geographic study. Part of the Llano Cristo has been captured by the San Miguel (Casas Grandes) drainage; but much

of it is still independent, and none of the water falling upon this portion of the high plateau of Mexico reaches either ocean. The Llano Cristo contains some of the sources of the San Miguel River,

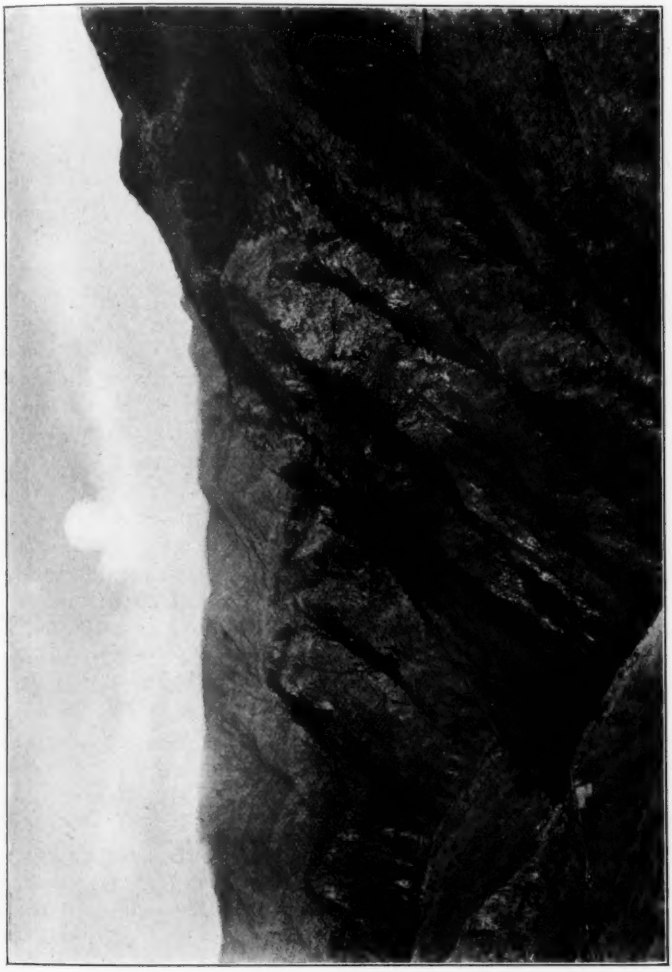

FIG. 2.—YAQUI (AROS) CAÑON AT GUAYNOPITA, 5,200 FEET DEEP. LOWER GORGE 1,800 FEET DEEP.

and is about 2,500 feet above the arid waste in which that stream loses itself.

Southward from Hacienda San Miguel our route lay along the

extensive prairies of the high mesa and across the spurs sent down from the mountain ranges, which traverse the plateau in a general north-south course. The mountains rise only from 1,500 to 2,500 feet above the mesa, and rarely is there a peak the altitude of which is more than 9,000 feet above the sea. All appear to be of volcanic origin, rhyolite and andesite lavas and tuffs predominating. The mesa itself gradually rises toward the south, and in the Llano Bavicora, a beautiful prairie 20 or 30 miles across, within the Hearst estate, is 7,000 to 7,100 feet in elevation. Moctezuma Pass (7,282 feet) is gained and crossed with scarcely a realization that the so-called "continental divide" has been traversed. The site of a large prehistoric village or city is indicated by the numerous mounds of the gently-rounding plain which forms the "Pass."

The inland drainage ceases here, and we are upon the edge of the Pacific drainage system, which is gradually "robbing" the plateau drainage. The newly-established lumber camp of Diedrick is in the mountains, just west of the summit of the plateau at Moctezuma Pass. Here the mountains rise abruptly to fully 9,000 feet above tide, and the trail to Guaynopita passes into the great cañon of the Yaqui River (here known as the Aros) at an elevation of 8,330 feet.

The view rivals that of the Grand Cañon of the Colorado. The Aros cañon is from 8 to 10 miles wide, and the river is from 4,500 to 5,000 feet below the highest points of the rim. From one point there may be seen nineteen flows of lava, one above another, with intervening beds of tuff and local conglomerate. The section here exposed gives additional support to the theory of mesa formation above expounded. Where the trail crosses the river (4,400 feet A. T.) there is a heavy bed of andesitic lava, showing the ropy character of the original surface of the flow. A thin bed of sandstone lies directly upon the lava, showing that this volcanic stream was covered with water soon after its extrusion.

Guaynopita, our next objective point, is a little mining camp hidden in the deep recesses of the Aros cañon, thirty miles by trail west of Diedrick. In reaching the camp we pass the ruins of an old arrastra, or mill, and the slag-pile from a neighbouring ancient furnace, where the Mexicans, generations ago, treated the copper, gold, and silver ores of the region. The romance and tragedy of mining have been carried through all these marvellous ravines, gorges, and cañons. At Guaynopita itself there is a splendid example of intrusive granite, associated with limestone. The limestone appears to be of late Cretaceous age; hence, the granite

is post-Cretaceous. Beautiful over-thrust faults are shown in the limestone, and in places metamorphism of the rock has gone so far as to produce schist. The ores (mostly chalcopyrite, cuprite,

FIG. 3.—YAQUI (AROS) RIVER AT GUAYNOPITA. SHOWS ABANDONED CHANNEL AT LEFT OF PRESENT COURSE.

and tetrahedite) occur disseminated through the granite and concentrated in quartz veins which traverse granite and limestone alike. The little district of Guaynopita is one of the most inter-

esting geological regions in existence, and several forms of ore deposits occur therein.

Leaving Guaynopita, our course lay somewhat east of south for four days along the high mesa, between the Aros River on the east and an important tributary, the Tutuaca, on the west. The mesa, or series of mesas, extending southward between these two rivers has a gentle dip toward the east and south; hence, the natural course of the streams of this region at first was toward the southeast, and the smaller streams still preserve this consequent course; but the master river, the Yaqui (Aros), and the Verde, the Tutuaca, and the Mulatos pursue an inverted course. The Chico alone of the great tributaries of the Yaqui (Aros) preserves its consequent course along the eastern slopes of the Candelaria Mountains. In several places the table-land is reduced to a narrow divide between the eastward and westward flowing drainage; but everywhere the western slopes are the steeper—the heads of the streams are being constantly pushed toward the east.

Twenty-five miles southeast of Guaynopita we encountered the old Temosachic-Dolores trail, and its well-worn mule-tracks looked like a highway across the Mesa Venado. For generations this was the route traversed by the hundreds of pack-trains needed for carrying supplies from Chihuahua to the mines of the Sierra Madre and for bringing back ore and bullion. Very recently a new route leading to the railway at Miñaca, with gentler grades, has been established farther south by American enterprise. Mesa Venado is several miles long and more than a mile wide; and lying as it does 7,400 feet above the sea, it supports a magnificent forest of the long-leafed sugar-pine. The timber of the high mesa is the real incentive for pushing forward the railroads, which are to make their way from the central plateau down to the Pacific Ocean.

Turning abruptly westward, we plunged from the Mesa Venado into a deep tributary arroyo of the Tutuaca, and made a complete cross-section of the Tutuaca cañon to Dolores. Rhyolite flows and ash-beds, and andesite flows and breccias, with an occasional bed of basaltic character, make up the foundation of the series out of which the gorges have been cut. Near the Tutuaca River there is a massive development of the conglomerate "mesa formation," corresponding to the La Brisca formation, which Hill has described from Sonora. These beds are hundreds of feet in thickness in places, but they appear to be local in development—the accumulation of "wash" in the basins of the original surface of the volcanic beds.

Where the trail crosses the Tutuaca the stream is about 125 feet wide and too deep for fording. The mining company at Dolores have built a primitive suspension bridge here for the convenient transfer of their freight. The water for the mill at the Dolores mine is pumped from the Tutuaca to a reservoir 1,700 feet above the river, which gives a head of 200 feet at the concentrator. The mine follows a siliceous vein carrying silver-bearing copper ore, which traverses a heavy bed of diabase. Several quartzose veins project like walls from the acid tuff beds of the region, and are the lodestone which attracted the ancients to the mineral deposits of Dolores and which has induced the modern miner to invest much money here.

Continuing southward from Dolores, we found the country more broken than it was on the east side of the Tutuaca; that is, the dissection of the mesas has continued farther and their tops are less extensive than farther east. At Yepachic, forty miles south of Dolores, we encountered the first agricultural Indian village we had seen since leaving Casas Grandes, a stretch of more than 125 miles in an air-line. The country is practically without permanent population, and it is only at rare intervals that one sees the ranch even of a squatter.

Our next objective point was Cerro Voludo, five miles southwest of Yepachic. The summit of this mountain (7,050 feet) is of densely-indurated rhyolite tuff, and is about at the altitude of the old mesa. Looking westward from Cerro Voludo, one gazes upon a wilderness of cañons and arroyos, with narrow ridges and sharp summits. The view is bounded by the profile of the edge of the great mesa between Trinidad and Mulatos. The topography is relatively old.

A few miles south of Cerro Voludo we leave the water-shed of the Yaqui River and descend 3,500 feet into the V-shaped cañon of the Rio de Mayo, here known as the Moris, which finds its way to the Pacific Ocean south of the mouth of the Yaqui.

In this cañon is to be found the best development that we saw of a dark blue conglomerate, apparently altogether of originally volcanic materials, which is older than the lighter-coloured, higher La Brisca formation. The dark blue conglomerate is massive, hundreds, if not thousands, of feet thick, is tilted at an angle of about 15° toward the southeast, and is separated from the later overlying beds by a long erosion interval, during which there was considerable deformation of the conglomerate. We propose to call this formation the Navosaigame. Water-worn fragments of bluish

limestone occurring loose in the river-gravel terraces of the cañon of the Mayo prove the existence farther upstream of marine beds, apparently of Cretaceous age.

FIG. 4.—CERRO VOLUDO. ALTITUDE, 7090 FEET A. T.

The trail led out of the Mayo cañon over the Cumbre Potrero into the Arroyo Rosario, which is tributary to the cañon in which Ocampo is located. The region is one of decomposed tuffs and

lava beds lying unconformably upon the Navosaigame conglomerate, and the whole series is cut by dikes of all sizes. Ocampo is a celebrated mining camp, better known, perhaps, by its old name of Jesus Maria. From one mine alone, the Santa Juliana, $100,000,000 of silver bullion were taken by its Mexican owners during the last century, but the shaft and lower levels are now flooded. The cañon is so deep, narrow, and crooked that one does

FIG. 5.—CAÑON, RIO DE MAYO (MORIS), AT NAVOSAIGAME. 4,000 FEET DEEP.

not see the town resting in its bottom, 3,000 feet below the rim, until he is fairly on top of it.

The population of Ocampo varies greatly with the prosperity or adversity of the mines. It is said to be about 5,000 now; but it is hard to see where so many people can be stowed away, even in the Mexican fashion. The cabins cling close to the walls of the V-shaped cañon formed by the junction of the two arroyos to make the great cañon. The route out northeastward toward Pinos Altos and Miñaca leads up the eastern branch, "Arroyo San Juan," and 2,400 feet above the camp comes out on the great mesa in the

midst of a magnificent forest of giant spruces. At Pinos Altos (from which, by the way, all the "lofty pines" have long since found their way underground as mine timbers) there is a remarkable

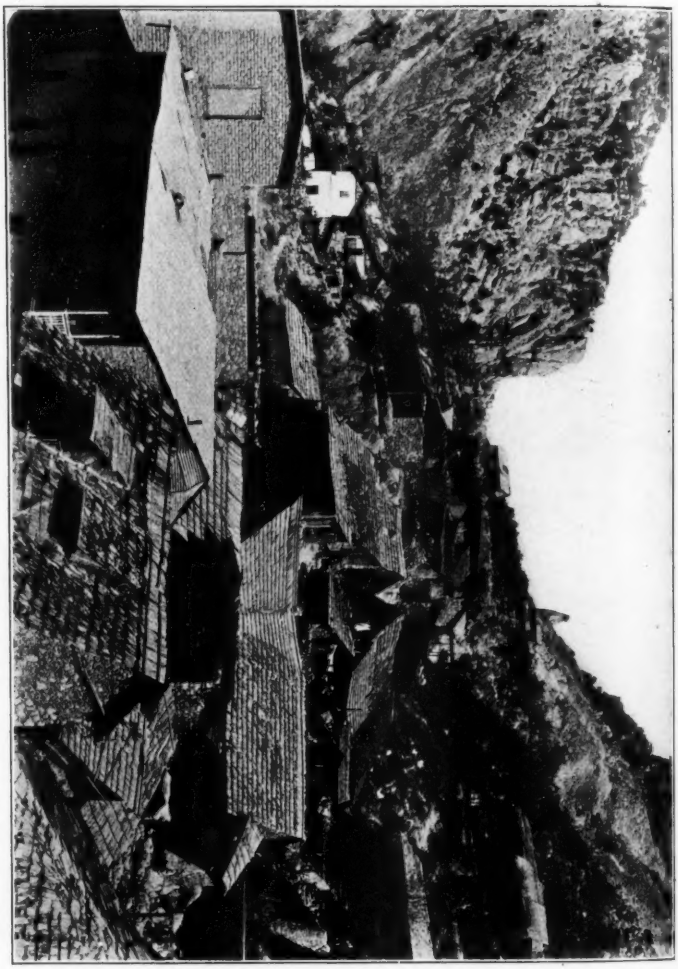

FIG. 6.—OCAMPO (JESUS MARIA). GREAT SILVER CAMP.

series of great quartz veins, which have resisted atmospheric destruction much more successfully than the country rock, and stand out from the mountain sides like gigantic buttresses.

The journey to Miñaca lies over the high mesa at altitudes from 6,900 to 7,300 feet above the sea. The mesa is partly dissected by the headwaters of the Rio de Mayo, the Tutuaca, the Verde, and their tributaries, and north northwest-south southeast ridges rise from 1,000 to 2,000 feet above the general level. The highest points are said to be about 9,000 feet above tide. Extensive flows of basalt are associated with the beds of rhyolite, andesite, and tuffs. Beds of sandstone, apparently old mesa formations, dip toward the northeast at an angle of about 20°.

Miñaca, the present terminus of the Chihuahua and Pacific Railroad, has been established in a beautiful basin-like mesa 7,200 feet above tide, near the base of Miñaca Butte, a mountain of obsidian, which received its name from its having been the last stronghold of General Miñaca, one of the heroes of Mexican history. The railroad is pushing on to the southwest, while toward the northwest a branch track is done as far as Temosachic. From Miñaca to Chihuahua the road traverses a series of bolsons, crosses the "continental divide" at an elevation of about 7,600 feet, and plunges through several picturesque gorges in basaltic and andesitic lava on its way to the bolson (4,633 feet A. T.*) in which the city of Chihuahua is situated.

The route from Chihuahua to El Paso is familiar ground to every traveller in Mexico. One long, narrow bolson succeeds another with gradually lowering altitude until the edge of the mesa on the border of the Rio Grande Valley is reached, when the grades become steeper for the last few miles into Ciudad Juarez. The region is arid and semi-arid, and toward the north one encounters the "bufas" or frog-like monoclinal mountains, the médanos or shifting sand-dunes, and the lagunas, all of which are like the features seen along the Sierra Madre and Pacific Railway.

* Elevation of the railway station at Chihuahua Mexican Central Railway folder.

American Museum of Natural History,
June 15, 1905.

ZUM KONTINENT DES EISIGEN SÜDENS.

VON

ERICH VON DRYGALSKI.

The importance of Antarctic exploration was first brought to Dr. von Drygalski's notice in 1883–84 by Freiherr von Richthofen. It was not until the later '90s, however, that the project of a German expedition was developed, largely through the efforts of Dr. Moritz Lindeman, Dr. L. Friederichsen, Professor G. von Neumayer, Karl Koldewey, Rear-Admiral Count von Baudissin, Dr. F. Schmidt, Minister Count von Posadowsky-Wehner, Dr. Th. Lewald, Professor Supan, and some others.

The keel of the *Gauss* was laid at the Howaldt works in Kiel in May, 1900, and she was practically finished in May, 1901. She was a three-masted schooner, with square sails on her foremast, and an auxiliary screw, and she was built principally of oak, teak, pine, and greenheart. She was 46 meters long, 10.70 meters broad, and had a speed of about seven knots.

The chief members of the expedition were Dr. Erich von Drygalski, Dr. Ernst Vanhöffen, zoologist and botanist; Dr. Emil Philippi, geologist and chemist; Dr. Friedrich Bidlingmaier, meteorologist; Dr. Hans Gazert, surgeon; Captain Hans Ruser, First Officer W. Lerche, Second Officers R. Vahsel and L. Ott, and Chief Engineer Albert Stehr.

It was decided to have a station for meteorologic and magnetic observations on Kerguelen Island in conjunction with the Antarctic expedition. Dr. Karl Luyken, Dr. Werth, and Dr. Joseph Enzensperger were chosen for this work, and went out on the S.S. *Tanglin*, taking with them the dogs for the *Gauss*. Dr. Enzensperger, unfortunately, died of beri-beri on Kerguelen Island on the 2d of February, 1903.

The *Gauss* started from Kiel Harbour on August 11th, 1901, and sailed *via* Madeira and the Cape Verde Islands to Cape Town, which was reached only on November 23d. The reason for this long passage was that much deep-sea fishing and many soundings and temperature measurements were done in the South Atlantic. The *Gauss* left Cape Town on December 7th, and proceeded, mostly under sail and sometimes under steam, to the Crozet Islands, which were reached on December 25th. These were found to be entirely

volcanic, and many sea-elephants were seen there. Thence the *Gauss* laid her course to Kerguelen Island, where she anchored in Royal Sound on January 2d, 1902. The auxiliary expedition of German scientists was met there, and the dogs were taken aboard.

The *Gauss* did not leave Kerguelen Island until January 31st. She reached Heard Island, which seems to be principally, if not entirely, volcanic, on February 3d. After a short stay, the *Gauss* sailed southeast, and began to meet icebergs in about 56° S. lat. on the 10th of February. In about 58° S. lat., soundings were taken which, for the first time, brought up stones of continental origin. The *Gauss* continued pushing south, with icebergs and pack-ice constantly on the increase. On the 14th of February she was on the edge of thick pack, and not being able to continue south, began to take a westerly course. At this point the *Gauss* was some distance north and west of Wilkes' extreme western point, near Termination Land. Four explorers—Cook, Wilkes, Nares, and Drygalski—have been round this spot,* and found the ice too solid to be penetrated, an almost certain proof that not far back there must be a supporting nucleus of solid land—"Termination Land"—under the ice. The *Gauss* now steamed west and southwest along the edge of the pack until on the 18th of February she was in 90° E. long. There the pack grew thinner, and she was able to make her way south and a little east, and on the 21st of February high land was seen northwest from the *Gauss*. This was in a direct line with the spot whence Wilkes saw "the appearances of land," which he charted as "Termination Land," and there can be no reasonable doubt that Dr. von Drygalski there saw the west coast of Termination Land.†

Later the same day, the *Gauss* reached a hitherto unsighted part of the coast of East Antarctica, west and a little south of Termination Land. This new land was christened "Kaiser Wilhelm II. Land." Its position is just south of the Antarctic Circle, between about 90° and 92° 30′ E. long. The edge was an ice wall 40 or 50 meters high, which sloped gently back to a height of some

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* *Antarctica*, by Edwin Swift Balch, Philadelphia, 1902, pages 70, 156, 195.

† In his first paper about his expedition in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1904, No. 1, Dr. von Drygalski spoke positively of the non-existence of Termination Land. The writer called attention to this as being an error in the *National Geographic Magazine*, May, 1904, Vol. XV, p. 220–221, and argued that "Termination Land" and Dr. von Drygalski's "Hohes Land" must be identical. Dr. H. Wichmann shortly afterwards acknowledged, in *Petermanns Mitteilungen*, the accuracy of this criticism. In a note in *Zum Kontinent des Eisigen Südens*, page 233, Dr. von Drygalski gives it as his opinion only that his "Hohes Land" can scarcely be identical with Termination Land; but he adds that he did not give any name to the "Hohes Land" and that the name "Kaiser Wilhelm II. Land" only applies to the coast-line on both sides of the Gaussberg.

300 meters, beyond which nothing could be seen. A fearful storm with heavy snow now came on, and the *Gauss* was tossed hither and thither in considerable danger among the ice, until the morning of the 22d, when she came to a stop just beyond 66° S. lat., in about 89° 45′ E. long. Here she was frozen in and remained until the 8th of February, 1903.

Winter soon came on, and the usual routine of a polar wintering was gone through, except, perhaps, that an unusual amount of scientific observations was made. Magnetic, astronomical, and meteorological stations were set up on the ice, and observations were taken regularly. A balloon was rigged up and numerous captive ascents were made, the first in Antarctica. A height of 500 meters was attained, and on one occasion the temperature at that altitude was high enough for Dr. von Drygalski to work without gloves. Zoological specimens were secured, among them several varieties of fish—*Notothenia*, *Lycodes*, and *Gymnodraco*. *Lycodes* is also found in the Greenland seas, and is another example that there is some similarity between the two polar faunas. Ice, icebergs, and ice temperatures were studied by Dr. von Drygalski himself, and he observed and took photographs of many forms and varieties of ice. None of these seems ever to have been of the prismatic kind which was especially studied by the Rev. G. F. Browne, and which the writer himself has often seen underground in *glacières*.* Much reading was done during the winter, and Dr. von Drygalski speaks highly of the works of Ross, Wilkes, and D'Urville, and he recognizes how easily mistakes could be made in the "forties" in regard to distinguishing land-ice and sea-ice, since even to-day, with all the accumulated knowledge on the subject, it is not always easy to do so.

Beginning with the middle of March, numerous sledge parties were sent out. On one of these, on the 22d of April, a small mountain was discovered to the southwest of the ship. It was christened the Gaussberg, and was ascended several times during the course of the year. It was largely free from snow, and appears to be volcanic in formation. Nests of several species of sea-birds were found in the hollows of the lava.

The expedition came to the same conclusions about clothing that most others have—namely, that furs were only useful to sit down or to sleep in, and that woollen garments with an outside canvas wind-breaker were far better suited for active work. The usual lack of flavour was noticeable in the preserved foods; and it was observed that it was well to have preserves come from as many

* *Glacières or Freezing Caverns*, by Edwin Swift Balch, Philadelphia, 1900.

different firms as possible, as it was noticed, for instance, that the same kind of soup tablets from two different firms had a more distinctive flavour than two different kinds of soups from the same firm. This led to the curious result, probably unique in the annals of cookery, that the *menus* were made up by mentioning the names of the firms instead of the contents of the tins. Seals and penguins, of course, were largely the basis of the diet. Quantities of sugar were craved by the men. Dr. von Drygalski himself considered six lumps in a large cup of tea the right number, and Dr. Bidlingmaier thought ten lumps made each cup of tea or coffee hardly sweet enough. The importance of sugar in a polar diet has never been so forcibly noticed before.

Towards January, 1903, fearing the ice might not break up, Dr. von Drygalski began to prepare to meet a relief vessel by retreating to Knox Land. He says "a voyage to this from the winter quarters of the *Gauss* would have to take place along the vicinity of the coast," which shows that Dr. von Drygalski thinks the coast stretches from Kaiser Wilhelm II. Land to Knox Land, or, in other words, that he really believes in the existence of Termination Land.

In January and February, 1903, the ice near the *Gauss* was cut with saws and blown up with explosives; yet little was accomplished. But in the beginning of February the ice began to break up of itself, and on the 8th of February the *Gauss* was able to work her way back towards the ocean, or, rather, was floated along with the slowly-moving pack. The course was nearly due west until the 25th of February, when the *Gauss* was in 86° E. long. There she was able to work her way northward, and on the 16th of March she reached the open sea. Here a westerly direction was taken to about 80° E. long, where an attempt was made to push south along the course where the *Challenger* crossed the Antarctic Circle, but heavy pack prevented the *Gauss* from reaching the 66th parallel. In the beginning of April the *Gauss* once more steered back to the open sea, sailed past Kerguelen Island, and in the end of April stopped at St. Paul Island and New Amsterdam Island. Thence she returned *via* Natal, Cape Town, and the Atlantic Ocean to Germany, reaching the mouth of the Elbe on the 24th of November, 1903.

It seems a pity that so much time was spent on the down voyage in the Atlantic. Had the *Gauss* reached the coast of Termination Land in the beginning of January instead of the middle of February, it is possible that much more exploring might have been done before she was frozen in, and the outline of East Antarctica as far as Kemp Land might perhaps have been roughly sketched in. With this

exception the expedition was well handled, and it has made some important additions to our knowledge of the Antarctic. Dr. von Drygalski's book is well and conscientiously written, but it errs, perhaps, in being too long, and it sadly needs an index.

The Belgians, the English, the French, the Germans, the Scotch, and the Swedes have now recently sent out Antarctic expeditions, with great benefit to science. These efforts appear to have stopped. Yet much remains to be done. Would it not be possible for America to take the matter up in turn? It almost seems as if it were a national duty to send a steamer like the *Bear* to repeat at least the voyage of Wilkes from Cape Hudson to Termination Land, and to try to chart more definitely the coasts of which he could, in his old sailing vessels, at the best only get glimpses.

EDWIN SWIFT BALCH.

UNITED STATES GEOLOGICAL SURVEY PUBLICATIONS.

PROFESSIONAL PAPERS. No. 29. Forest Conditions in the Absaraka Division of the Yellowstone Forest Reserve, Montana, by John B. Leiberg. Contains the usual description of forest conditions, with land classification and map. In view of the sharp differences of opinion now expressed about glacial erosion, it is of some interest to find the author speaking of the Pleistocene glacier as sculpturing and fashioning the region into its present forms, cutting gorges thousands of feet deep. More than 30,000 acres in the Reservation are occupied by lakes of glacial origin, lying either in rock basins or behind masses of moraine.

No. 30. This also belongs to the Forestry series, is by the same author, and describes the Little Belt Mountains Forest Reserve and the Little Belt Mountains quadrangle, shows composition of the forest, gives distribution by regions and altitudes, and gives township descriptions.

No. 31. Preliminary Report on the Geology of the Arbuckle and Wichita Mountains in Indian Territory and Oklahoma, by Joseph A. Taff. Reported ore deposits of the Wichita Mountains are discussed by H. Foster Bain, the investigation leading to negative results and no encouragement to further prospecting.

BULLETINS. No. 234. Geographic Tables and Formulas, compiled by Samuel S. Gannett. Brings together matter needed in field and office by members of the Topographic Corps.

No. 236. The Porcupine Placer District, Alaska, by Charles W. Wright. This region is in southeastern Alaska, and its develop-

ment has awaited the settlement of the International Boundary. It is of moderate extent, but believed to be capable of profitable working. The production has risen from $1,000 in 1898 to $150,000 in 1903.

No. 240. Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for the year 1903, by Fred Boughton Weeks.

No. 242. Geology of the Hudson Valley between the Hoosic and the Kinderhook, by T. Nelson Dale. Deals mainly with structural geology. In a brief reference to economic phases the author points out that rye, one of the chief products of Rensselaer County, has a special affinity for the soils made from the greenish Cambrian shale of the region, and will grow on what is almost a bare ledge of this rock.

No. 259. Report on Progress of Investigations of Mineral Resources of Alaska in 1904, by Alfred H. Brooks and others. This Bulletin illustrates in its early appearance the new policy of the Geological Survey to give the promptest possible publicity to facts of economic bearing. This gives information to prospectors and investors, and saves useless expenditure.

The value of the Survey work receives interesting confirmation in the prediction of high-level placer beds at Nome. The field work of 1899 showed the fact of general uplift, and on the basis of this fact the geologist inferred that elevated beaches and high benches bearing gold might be found. Millions of dollars have been taken from such deposits, later found.

The report contains a folding sketch map showing the chief localities of the various minerals of the Territory. Nine parties were sent into the field during the year 1904, the field season being, of course, very short.

Much of the report is given to placer mining. Ignorance of the special conditions has led to much wasteful expenditure, as in setting up plants where water supply was poor or installing steam shovels without taking account of the frozen ground. The Alaskan season is short, transportation and labour are expensive, and it is no place for a hit-or-miss policy.

Underground alluvial mining is increasing on the Seward Peninsula. This makes continuous work possible, and the product of the winter of 1903–4 was more than $1,000,000. Drifting is used in gravels ranging in thickness from 40 to 150 feet. Wages are stated as 50 per cent. less in winter than in summer.

A genuine bonanza in placer gravels was found in October,

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1904. It was said that it yielded, worked with a rocker, 200 pounds of gold in seven hours. Rival claimants were active, and served four injunctions on the owner within twenty-four hours. The summer of 1904 was poor in results, as water was scarce. The snows of the previous winter and the rains of early summer were light.

Attention is given to the further development of tin in this region. Work has now begun in lode-mining, the early finds being of stream tin. An ore body of about 60 x 15 feet has been found on Cassiterite Creek. Twelve tons of ore shipped to Seattle carried ten to twenty per cent. of metallic tin.

No. 264. Record of Deep Well Drilling for 1904, by M. L. Fuller and others. It is proposed to publish annually the results of investigations in this field, the co-operation of drillers and contractors being sought. The present report gives the record of wells from which samples have been received by the Survey.

WATER SUPPLY AND IRRIGATION PAPERS.—No. 109. Hydrography of the Susquehanna River Drainage Basin, by John C. Hoyt and Robert H. Anderson. In addition to the economic bearing of such papers, which is no doubt their main object, they should be useful to teachers of geography within the basins described, particularly at many points where the flow has been measured and the figures would furnish basis of interest and of discussion in the classroom. Thus such large local centres as Binghamton, N. Y., and Wilkesbarre, Williamsport, and Harrisburg, Pa., are included. The sketch map on page 11 isolates this system by showing the surrounding territory in plain white. Another Bulletin (108) will deal with the quality of water and the physiographic features of the same basin.

No. 115. River Surveys and Profiles made during 1903. Arranged by W. Carvel Hall and John C. Hoyt. Southern Appalachian localities chiefly occupy the report, and facts are given for which, as stated, there is much demand by engineers and others interested in developing power. Studies of the Chippewa River, Wisconsin, fill the closing pages.

MONOGRAPH.—No. XLVII. A Treatise on Metamorphism, by C. R. Van Hise. This is a bulky volume, mainly devoted to technical questions of geology. As, however, it treats metamorphism broadly, it touches some questions of interest in physical geography. Such are, the circulation of ground water, the belt of weathering, the work of plants and annuals, and the rate of weathering. A. P. B.

GEOGRAPHICAL RECORD.

AFRICA.

DR. UHLIG'S EXPLORATIONS AMONG HIGH AFRICAN MOUNTAINS.—The ascent of the Kibo summit of Mount Kilimanjaro in the summer of 1903 by three members of the East Africa expedition, led by Prof. Dr. C. Uhlig, was briefly described in the BULLETIN of 1904 (pp. 754–5). Dr. Uhlig has written for the *Zeitschrift* of the Berlin Geographical Society (Nos. 9 and 10, 1904) two articles entitled "Vom Kilimandscharo zum Meru," which form a preliminary account of the scientific work of this expedition. He reached a height of 19,500 feet on Kibo, the higher of the two summit peaks of Kilimanjaro, but the culminating point of Kibo, the top of Kaiser Wilhelm Peak, was still 200 feet above him. In addition to the facts mentioned in our earlier account of this ascent, Dr. Uhlig gives interesting details concerning the snow and glacier formations, illustrated by excellent photographs.

One feature is the occurrence on the surface of the slopes of long lines of strangely-shaped snow figures, several feet in height, considerably taller than those observed in the snow fields of the Andes, and which have been called "nieves penitentes," from the similarity they bear, when seen at a distance, to processions of white-robed penitents. The explorer says that those he saw on Kilimanjaro looked more like rabbits, dogs, and snow-men built by children than penitents. He attributes their formation to the ablation from insolation and the dryness of the air, though this does not explain "their regularity of arrangement, as they appear in two distinct lines, one up and down the slope and the other at right angles to the slope," or, in other words, along the contour lines. It is suggested (*Amer. Jour. of Sci.*, July, 1905) that this arrangement may be due to the cracking of the hardened snow in this regular manner, and that this, combined with the agencies he mentions, may explain the phenomenon.

On a second ascent of Kibo from the south, he discovered a new glacier, to which he gave the name of Richter Glacier.

The explorer then turned his attention to Meru, a great volcano to the west of Kilimanjaro, of which little has been known:

> Its height is about 15,200 feet. Uhlig's first ascent was made from upper Aruscha, on the south flank, at an elevation of about 4,500 feet. At 7,000 feet a girdle composed of dense masses of bamboos was met, which lasted to about 8,800 feet, and which required the greatest efforts to penetrate. It appears quite similar to the bamboo zone which Gregory encountered on Mt. Kenia, and which he found so difficult to surmount. Above this the mountain offered no special difficulties aside from the extraordinary steepness of its slopes. Towards its upper limit the flora assumes the distinctly alpine character noted on the other great volcanoes of equatorial Africa. Some forms of vegetation, grasses, compositæ, and *Arabis albida* persist even to the top.
>
> No snow was found on Meru, its summit falling over 2,000 feet short of the snow-line on the neighbouring Kilimandjaro. Nor were any marks of a former period of glaciation visible, although on Kilimandjaro, according to Meyer, the glaciation once extended some 3,000 feet lower than at present, and Gregory found evidences of much more extended glaciation on Kenia than it now shows. It is possible, however, that Meru may have had small hanging glaciers.

At the summit Uhlig found himself on the edge of a vast crater whose precipitous walls fell beneath him over 4,000 feet to the bottom. The highest point on the opposite wall he attempted in a second ascent from the northeast, but was unable to attain.

The mountain is a concentric crater, which shows several periods of volcanic

activity. The completion of the Uganda Railroad and the continued, though slow, advance of the German railroad inland from Tanga, making wide areas easily accessible, are likely to stimulate detailed studies of other parts of eastern equatorial Africa, such as Uhlig has been making in the region of Kilimanjaro.

GEOGRAPHY AT THE BRITISH ASSOCIATION MEETING.— *Nature* (July 6) announced the completed arrangements for the South African meeting of the British Association. The number of members to attend the meeting was 385, of whom no less than 276 had announced their intention to visit the Victoria Falls after the ordinary work of the association. The lectures of a popular character to be delivered before citizens of the various towns where meetings were held included these geographical topics:

At Durban, "The Highest Himalaya," by Douglas W. Freshfield; at Bulawayo, "Zimbabwe," by Mr. Randall-MacIver.

The programme arranged for Section E (Geography) was as follows:

Cape Town.—President's address: "Afforestation of South Africa;" "The Ordnance Survey of the United Kingdom," by Col. Johnston; "The Unveiling of the Coasts of Africa" (lantern views of old maps), by H. Yule Oldham; "A Comparison of the Periodicity of the Meteorological Conditions of London and Cape Town," by Dr. H. R. Mill; "Gough Island," by Rudmose Brown; "Terrestrial Globes as a Necessary Adjunct to the Teaching of Geography," by Capt. Creak; "Excursions as a Means of Teaching Geography" (lantern), by J. Lomas.

Johannesburg.—"The Evolution of Africa," by Dr. J. Scott Keltie; "A New Rainfall Map of Africa," by A. J. Herbertson and P. C. Waite; "Boundaries and Areas in Africa," by J. Bolton; "The Physical Geography of the Transvaal," by Tudor Trevor; "Notes on the Geography of Africa South of the Limpopo," by F. S. Watermeyer; "The Game Preserves of the Transvaal," by Major Stevenson Hamilton; "The Sikkim Himalayas and Tibet," by Mr. Freshfield; an Asiatic subject by Prof. Cordier.

THE SUDAN ALMANAC FOR 1905.—This little annual, printed for residents in the Anglo-Egyptian Sudan, naturally contains much information not found in our own works of reference. The edition for 1905, for example, tells the people that they need not be afraid of desert water, even though it may be muddy, for all water of the desert is wholesome. If they find it brackish, however, they must not drink too much of it. If they meet water which tastes so badly that they cannot drink it, they may find some relief from thirst by immersing their arms in the water and keeping them there for some minutes. It is a good practice to sink in a muddy well a large tin or biscuit box perforated with small holes and covered on the outside with cotton cloth, the top of the box remaining above the surface of the water. The cloth will act as a strainer and the water in the box will be comparatively free from mud. Travellers carrying water with them are informed that a gallon of water weighs ten pounds, and a cubic foot of it sixty-two pounds. The minimum drinking water allowance for a man should be one and one-half gallons a day. A camel drinks from 12 to 18 gallons at a time, and should, if possible, be watered every other day. A horse drinks 6 gallons a day, one and one-half gallons at a time. For a long camel ride the waist and lower chest should be swathed fairly tight, with cloth bands to give support. To avert fever, mosquitoes should be avoided, and therefore camps should not be made near stagnant water.

AMERICA.

RETREAT OF THE ALASKAN GLACIERS.—Prof. George Davidson, who has carefully studied all the old charts and narratives relating to the glaciers along the coast of Alaska, has written a paper, "The Glaciers of Alaska that are Shown on Russian Charts or Mentioned in Older Narratives" (*Trans. and Proc. of the Geog. Soc. of*

the Pacific, Vol. 3, Series 2). He presents, with the paper, copies of a number of the early charts, with the outlines of the latest maps, showing in this manner the changes that have occurred in the position of the ends of some of the glaciers. As nearly as he can determine there has been a general recession of the glaciers through the Aleutian Islands, the Peninsula of Alaska, and from Cook Inlet to Portland Channel, except where they come directly, or almost so, upon the broad ocean. The evidence of advance seems clear at Wimbleton or Taylor Bay, just inside Cape Spencer, at Icy Strait, since the survey of Whidbey; but the recent topographical survey by the U. S. Coast and Geodetic Survey shows a retreat behind the terminal moraine which it has left as a record.

The Malaspina Glacier has filled and obliterated the Icy Bay of Vancouver and Tebenkof. The recent Canadian Survey indicates that the glaciers of Lituya Bay have shortened the deep arms described by La Pérouse; and the La Pérouse Glacier, upon the ocean shore, shows positive signs of advance, according to the reports of the Harriman Expedition of 1899. In this region of advance, however, the immense ice blockade at the head of Yakutat Bay, so well depicted by Malaspina and confirmed by Tebenkof, has been carried away, and the Turner and Hubbard glaciers now discharge into the sharp bend of the fiord at the head of the bay. It is gratifying to note that wherever the recent surveyors have located a glacier front, they have given good bases for comparison with future surveys of similar character.

MARYLAND AND JOHNS HOPKINS UNIVERSITY.—The State of Maryland continues to illustrate the advantages of associating the scientific staff of a great university with the work of carrying out public utilities of a scientific character. Since their organization the Maryland Geological and Economic Survey and the Maryland State Weather Service have both been in charge of Prof. William Bullock Clark, who occupies the Chair of Geology in the University. The State annually appropriates the sum of $27,000 for the support of these two bureaux. An important number of Prof. Clark's assistants in these public services are members of the Faculty at Johns Hopkins. All the volumes of the "Maryland Geological Survey," from the first in 1897, together with the series of exhaustive reports on the resources of various counties, the volumes dealing with the systematic geology and paleontology of the State, and the various reports on the Physiography of Maryland and the State Weather Service, are permeated with the scientific spirit of the University staff, and to a considerable extent are the results of field work carried out by members of the Faculty. By a recent act of the Legislature the Geological Survey has also received control of the construction of the State highways, involving an annual expenditure of $400,000.

THE NORTHERN MAIDU.—These Indians of California, more commonly known as "Diggers," though that meaningless name is also applied to other Indians in that State, live in the northeastern portion, roughly speaking, between the Sacramento River and Nevada. Their language is distinct from that of other tribes, and they therefore constitute a stock by themselves, but they lack, like many other aborigines of the Pacific slope, any collective name as a group. Stephen Powers called them "Maidu," a word in their language meaning "Indian" or "Man." The study of these people was a part of the work of the Huntington Expedition in 1899, 1900, 1902, and 1903, and Mr. Roland B. Dixon has prepared a paper embodying the results of the investigation of the Northern Maidu, which appears in the *Bulletin* of the American Museum of Natural History (Vol. 17, Part 3, pp. 119–346), in which their history, material culture, social organization, customs, religion, etc., are described.

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It is noteworthy that the Maidu, like most of the other stocks of California, have not been migratory on any large scale. It is in this respect that the Californian peoples differ greatly from the tribes and stocks of the eastern and central parts of the continent, which have been migratory on a large scale, and show over great areas a considerable uniformity of culture, while the California peoples show greater stability; and the culture of each tribe or stock being shaped in accordance with its own continuous environment, a greater variety of culture is apparent in California than in the East.

Many woodcuts illustrate the meagre arts of the Maidu, and a number of photographs show their huts, dance-houses, etc. No tribe can be wholly typical in a region of so much diversity as California, but Mr. Dixon says that in the simplicity of their culture, small development of the arts, dependence on roots, acorns, seeds, fruits, and game for food, rudimentary social organization and general character of their ceremonial life, the Maidu represent as well as any other stock the aboriginal culture of that part of the State.

PROPOSED EXPLORATION OF THE EAST COAST OF GREENLAND.—Since Peary rounded the most northern point of Greenland and mapped the north coast the only shore of the island that remains entirely unknown is the region between Cape Bismarck, in about 76° 40′ N. Lat., and Independence Bay, discovered by Peary. This unexplored stretch of the east coast extends for a distance of about 400 miles. Mr. L. Mylius Erichsen of Copenhagen, who was the leader of the so-called Danish Literary Expedition to Greenland which returned to Europe last year (BULLETIN, 1904, pp. 363–4), has declared his willingness to undertake the important task of exploring this part of the coast, and thus completing our knowledge of the periphery of the island. He is now endeavouring to raise funds for his expedition. Sir Clements R. Markham, in his address to the Royal Geographical Society in May (*Geog. Jour.*, July, 1905), emphasized the importance of making this exploration:

> It is, in some respects, a region of special interest. Here, if anywhere, a knowledge may be obtained of the very interesting migrations of Eskimo and large mammals from east to west. Clavering, in 1822, found 12 Eskimo on the coast between 74° and 75° N. But none has ever been seen since to the north of the settlement of Angmagsillek. Knowledge is also needed of the northern migrations of the musk-ox, reindeer, wolf, and fox. The numerous deep fiords should be explored, and the labours of the German expedition, of Nathorst, and of Amdrup require to be connected and completed.

Mr. Erichsen has already demonstrated his capacity, and the task he proposes would be in good hands under his leadership. He lived among the Smith Sound Eskimo for ten months, sledged across the island of Disco, visited the inland ice in two places, and knows most of the western coast of Greenland. His party sledged northward along the west coast from Jakobshavn in the south to Saunders Island in the north, and this was the first time that a sledge expedition skirted the entire coast of Melville Bay.

UNDERGROUND WATER RESOURCES OF THE GREAT PLAINS.—Mr. N. H. Darton, of the U. S. Geological Survey, has written a volume of 433 pp., entitled "Preliminary Report on the Geology and Underground Water Resources of the Central Great Plains" (U. S. Geol. Survey, Prof. Pap. 32). The geological features of the area discussed (most of South Dakota, Nebraska and Kansas, and westward to Central Wyoming and Colorado) are fully presented in the first half of the quarto; but the chief interest of the investigation lies in the question of water supply, which is very inadequate in a large part of this territory, and must be supplemented where possible by artesian wells, many of which have been sunk with excellent results.

It is believed that the rocks of Cambrian, Ordovician, Carboniferous, and Jurassic

age underlie this entire area; but very few wells are found lower than the Cretaceous, and the water horizon of the Dakota sandstone is the most widely extended and most useful in the Great Plains. The sandstones outcrop extensively along the uplifts of the Black Hills, the Big Horn, and the Rocky Mountain front ranges, and in the Arkansas valley in Southern Colorado, where they receive large volumes of water, both from the rainfall and the sinking of water from streams.

The most important prospects of water from the Dakota sandstone, as yet undeveloped, are in the central and western parts of South Dakota, and in the region north of the Black Hills. In this formation, the author says, over 1,000 deep wells have been sunk east of the Missouri River, most of which are from 500 to 1,000 feet deep, and generally yield a large supply of flowing water, which is used for irrigation. The aggregate flow from these wells is about 7,000,000 gallons a day. There is as yet no valid evidence that the supply is diminishing, except in places where there are numerous wells. The supply from the Fox-Hills formation is much more limited. Useful wells are also developed in the Tertiary, particularly in the Denver basin. Large quantities of water from limited depths (5 to 50 feet) are also obtained from the alluvial deposits of the Quaternary, and the tubular wells in east South Dakota and east Nebraska yield the water of the glacial drift mainly at the base of the till.

The fact that the water is under great pressure shows that its altitude, where it originates, must be some thousands of feet above the point of delivery. Some wells in eastern South Dakota, for example, show surface pressures of over 175 pounds to the square inch, and two are over 200 pounds; in the latter case a pressure of 780 pounds at the bottom of the well is indicated. The volume gives full details concerning existing wells, and closes with a discussion of the economic geology of the region, such as the supplies of coal, petroleum, salt, gypsum, gas, etc. There are many fine views from photographs, and also geological maps and sections.

The Conventions of Weather Bureau Officials.—In the mind of the general public the work of the Weather Bureau is usually associated only with the publication of daily weather maps and forecasts. There are, however, many activities in which the officials of the Bureau are engaged which are of a less public and consequently less well-known character, but which nevertheless deserve a wider recognition. Among these may be noted the several conventions of the officials of the Bureau. These gatherings are the means of bringing together, in a social way, many members of the Weather Service who would otherwise seldom or never meet, and thus of promoting an *esprit de corps* which tends to consolidate and to harmonize the various activities of the Bureau. But of more importance than the encouragement of the feeling of good fellowship and of co-operation is the opportunity for hearing and discussing papers on a very wide range of subjects of general interest in national weather service work. The papers which are presented at these conventions are, as a whole, marked by a direct, forceful, practical treatment of the matters which they deal; they furnish topics the discussion of which cannot fail to be of value to all those present, and in the printed reports of the proceedings of the conventions they are brought before the larger audience of the voluntary observers of the Bureau and of meteorologists in general the world over. The scope of these gatherings has gradually been enlarging since the first meeting was held in 1892, and their scientific value has steadily increased. In future years, as later meetings are held in different parts of the country, the good results which come from such conferences will be more generally appreciated and will attract more attention.

The first convention under the auspices of the National Weather Service was held at the Smithsonian Institution, in Washington, on February 24 and 25, 1886.

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There were among the members of that convention the head of the Signal Service, Gen. W. B. Hazen; Messrs. Abbe, Ferrel, Mendenhall, Davis, Rotch, Upton, and representatives of State weather service organizations from Alabama, Indiana, Minnesota, New York, and Ohio. In 1892 there was organized the American Association of State Weather Services, which held its first meeting at Rochester, N. Y., August 15 and 16, 1892. The report of this meeting was published as Weather Bureau Bulletin No. 7, 1893. The second meeting was held in Chicago, August 21 to 25, 1893, in conjunction with the larger Congress under the auspices of the World's Fair, and the papers were published in Bulletin No. 11 of the Weather Bureau. The third meeting was at Brooklyn, N. Y., August 17, 1894, in conjunction with the American Association for the Advancement of Science. Bulletin No. 14 of the Weather Bureau contains a report of the proceedings. The fourth and last meeting of the American Association of State Weather Services was held at Indianapolis, Ind., October 16 and 17, 1895 (see Bulletin No. 18). This Association had from the start been nominally an affiliated society of the American Association for the Advancement of Science, but only two of the meetings of the former were in conjunction with those of the latter—viz., those at Rochester, in 1892, and at Brooklyn, in 1894. It was found that the meeting-places of the American Association for the Advancement of Science were often inconvenient for the Weather Bureau officials.

When Prof. Willis L. Moore became Chief of the Bureau the plan of these conventions was altered. It was decided that the membership should be composed of officials representing without restriction all lines of work conducted by the Weather Bureau, and that the conventions should be held once in three years instead of annually. The first convention of Weather Bureau Officials, under the new plan, was held in Omaha, Neb., October 13 and 14, 1898, the change in the membership of the gathering being evidenced by a change in the kind and number of the subjects discussed. In former years the discussions dealt with the climate and crop side of the Weather Bureau Work. The deliberations of the convention of 1898 covered practically the entire range of the Weather Bureau Work (Bulletin No. 24). In 1901 the Convention was held in Milwaukee, Wis., on August 27 to 29 (Bulletin No. 31), and in 1904 at Peoria, Ill., on September 20 to 22. The Proceedings of the Third Convention of Weather Bureau Officials, recently published by the Weather Bureau, in an octavo report of 267 pages, show that a wide range of subjects, of great national interest and importance, was ably presented and discussed at this latest meeting. R. DEC. W.

THE VARIATION OF RAINFALL IN THE ARID REGION OF THE UNITED STATES.—More attention than ever before is being paid to questions of rainfall and of irrigation in the arid portions of the United States. The Weather Bureau, with its large collections of rainfall data, is constantly endeavouring to put before the public all the latest information which is available concerning the conditions of precipitation in those large sections of the country which are usually classed as arid. The latest publication in this connection is Bulletin *N*, entitled *Periodic Variation of Rainfall in the Arid Region*, by William B. Stockman, Chief of the Division of Meteorological Records of the Weather Bureau. This paper was read before the Twelfth National Irrigation Congress, which met at El Paso, Texas, November 16 to 18, 1904, and deals with rainfall at selected stations which lie between the 96th meridian and the central portions of Washington, Oregon, and California. Those stations were selected which show best the average conditions that have prevailed generally over the State or region in question, due consideration being given to the length and the continuity of the record and the altitude of the station. A large chart contains dia-

grams for eighty-four stations in the arid and sub-arid regions, showing graphically the average precipitation for each month. No isohyetal lines are drawn to show annual or monthly amounts of rainfall, but instead the data are given in tabular form. Table I shows the excess or deficiency of the annual average for the pentads (five years) as compared with the average annual precipitation for the entire period of observation. Table II shows the average monthly and annual precipitation at selected representative stations in the arid region. During the several pentads from 1869 to 1903, inclusive, the numbers of stations noted in the following table showed an excess or deficiency as compared with the entire period:

PENTAD.	STATIONS.	
	PLUS	MINUS
1869–1873	5	9
1874–1878	16	13
1879–1883	16	22
1884–1888	27	15
1889–1893	26	21
1894–1898	16	33
1899–1903	13	37
Total	119	150

It appears, therefore, that 119 stations showed an excess and 150 showed a deficiency. When the amounts of the excesses and deficiencies at the various stations are summarized a total deficiency of 26.02 inches is found for the whole period and the whole number of stations.

While this *Bulletin* cannot be considered very satisfactory, in view of the great differences in the length of the records and of the fact that they are not all reduced to the same period of time, it does present facts which are of interest to a large number of persons who have to do with our arid and sub-arid districts. R. DEC. W.

OPPORTUNITIES FOR INVESTIGATION IN THE OLYMPIC PENINSULA.—This peninsula occupies the extreme northwest corner of the United States, and, as all maps show, is almost cut off by water on every side. The irregular group of the Olympic Mountain ranges that radiate on all sides from Mount Olympus (8,150 feet) occupies most of the peninsula. The Olympic Forest Reserve, set apart in 1897, also includes most of the peninsula, which cannot now be said to be almost wholly unknown, as was the case ten years ago, for the Reserve has been traversed and studied, at least as far as its forest conditions are concerned, by the Geological Survey. The work of examination was carried on during the seasons of 1898, 1899, and 1900 by Messrs. Arthur Dodwell and Theodore F. Rixon, whose report was published in the 21st Annual Report of the U. S. Geol. Sur., Part V, and in 1902, somewhat expanded, as Professional Paper No. 7.

Numerous glaciers and snow fields were found in the central parts of the mountains and many rivers heading in the central mass and radiating outward in all directions.

This report does not deal, however, with the geology or some other important aspects of the peninsula. The following timely statements are condensed from an article by Mr. Henry S. Conard (*Science*, No. 532), who says that here is almost virgin soil for nearly all kinds of scientific investigation. He refers to the above-named paper, with its maps and illustrations, as the best account yet available concerning this region:

. . . . The vegetation of the Olympic Peninsula is truly remarkable. Below 5,000 feet is the great northwestern forest, which must be seen to be appreciated. Douglas fir, tideland spruce and "red

cedar" (*Thuja plicata*) reach gigantic proportions. . . . What with fallen timber and undergrowth of ferns and shrubs the forest is a veritable jungle. By hard work one can travel a quarter of a mile an hour off the trails! . . . .

The matted tree tops admit only a gloomy light below, and the darkness is deepened by great blankets of *Selaginella* (*S. oregana*) and bearded lichen (*Usnea*) depending from the branches. A thick bed of moss covers all the ground and swathes the bases of the tree trunks. Above 2,000 feet, however, the forest is quite open, but travel is impeded much more seriously by the impassably sharp hogbacks and steep canyon walls. The mountains slope more gently southward than on other sides, and it is believed that Mt. Olympus could be reached from the valley of the Quiniault River. . . .

The fauna is equal to the flora in richness. Black bears, panthers, wild cats and wolves are numerous. A few squirrels and the mountain beaver are found. Deer and elk are plentiful. The garter snake is the only reptile. Wild duck and pheasants are occasional, and the familiar robin is seen about the houses. Salmon and trout of several kinds abound in all streams that are large enough. Quiniault salmon is said to be the finest on the coast. The report of the expedition from the Field Columbian Museum on the mammals of the Olympic Peninsula is the only record of its fauna.

In each river valley a distinct tribe of Indians originally made its home. The Makah at Cape Flattery were studied by Swan, and are an extremely interesting group. The Quillayutes and Quiniaults would equally repay an immediate investigation; but their old habits are rapidly vanishing before the Government schools. Whites began to settle the Quiniault Valley in 1892, but the movement is very slow on account of the difficulty of clearing land and of getting produce in and out. It is estimated to cost $200 an acre to remove the timber enough for farming operations.

Persons speak of the Olympics as volcanic, but we saw no sign of volcanism either in the rocks or in the pebbles of the Quiniault or Queets rivers. Along the coast a soft, green, marly, Cretaceous sandstone lies in gentle folds, each crest jutting out to sea as a steep headland 150 to 500 feet high. Rivers occupy the synclines. In the sandstone many fossils are found. Especially noticeable were stumps, logs and fragments of wood at different levels and in various stages of transition to lignite. Capping this stratum is a layer of recent yellow gravel, varying from ten to forty feet in thickness, and also enclosing logs and stumps. . . .

METEOROLOGICAL INSTRUCTION IN THE UNITED STATES.—Within the last few years several efforts have been made to obtain accurate information regarding the exact conditions of meteorological instruction in the schools and colleges of the United States. The investigation is one well worth undertaking, because the subject of meteorology is one of great and growing importance, and because the status of meteorological instruction is uncertain and, on the whole, discouraging. The unsatisfactory conditions may be explained in various ways: the feeling that meteorology is not worthy of a recognized place in school or university curriculum; the lack of capable teachers; the failure of school authorities to allot the necessary time for the work; the fact that there is no career open to any considerable number of trained meteorologists, and so on. Doubtless these, and many other reasons, have operated to keep meteorology out of the place which it is slowly winning for itself; for that it is gaining ground year by year is clear to any one who looks over the field of common-school and of college education year after year. There is no question that students of geology, botany, zoology, medicine, and engineering, to mention no other subjects, would all be much helped by a fairly systematic training in the elements of meteorology, and, were such instruction required of them, the teaching of meteorology would at once be extended and improved throughout the country, both in schools and in colleges. This would mean a greater demand for teachers of meteorology. That there is opportunity for persons skilled in meteorology and climatology to make themselves useful and valuable in many different lines of business activity there is no question. But more and more emphasis should be laid on the practical application of the facts which the students acquire, in climatology especially, where the importance of the climatic control over the occupations and activities, as well as over the health of man, has received far too little emphasis.

About a year ago, by direction of the Secretary of Agriculture, a circular letter was sent to all persons who were believed to be engaged, or interested, in the teach-

ing of meteorology in schools and colleges in the United States. The object of the inquiry was to obtain information regarding the number and character of the courses of instruction that are now being given; the demand for such courses; the didactic value of meteorology as a course of mental training, and the commercial or pecuniary value of meteorology as a professional career. The replies to this circular, which have been printed by the Weather Bureau, may be briefly summarized as follows: At several of the universities and colleges courses in elementary meteorology are given, usually by instructors whose main business is along other lines of work. In some cases such courses have been given and then discontinued. Weather Bureau officials in many places are doing their best, in a most praiseworthy manner, to stimulate interest in the study. Scattering schools, here and there, where the teachers of physiography or of some other branch of science have a special interest in meteorology, pay some attention to systematic work in the subject. But there is a very evident lack of proper, systematic, thorough, well-co-ordinated instruction in meteorology in the country as a whole, from schools to universities. There is but one university where meteorology may be taken as a subject for admission, and that same university is the only one in the country which deems meteorology and climatology of sufficient importance for one professor to give his whole time to teaching the subjects.

R. DeC. W.

REPORT OF THE SUPERINTENDENT OF THE COAST AND GEODETIC SURVEY, 1904.—This report gives the progress of work from July 1, 1903, to June 30, 1904.

Mr. O. H. Tittmann, Superintendent, reports the completion of determination of difference of longitude between San Francisco and Manila. This work also determined the longitude of Honolulu and Guam. The new Alaskan boundary was taken up subsequent to the decisions of the Boundary Tribunal, and magnetic determinations have been made at 367 stations.

Field work was accomplished for revision of two volumes of the Coast Pilot, covering the coast from Point Judith, R. I., to the entrance of the Chesapeake Bay. The charting of the imperfectly-known waters of the Philippine Archipelago was carried on during the year.

The comprehensiveness of the Survey's work appears in the fact that one member served on the Mississippi River Commission; work was completed on Mason and Dixon's Line between Maryland and Pennsylvania; work was done on the oyster beds of Louisiana; the Superintendent aided in presenting the American Case to the Alaskan Tribunal; and the vessels of the Survey several times responded to calls to patrol racing regattas. The total appropriation for the year was nearly one million dollars. In the necrology for the year is found the name of a well-known member of the force—Mr. Adolph Lindenkohl. The record of field operations in detail fills most of the volume.

A. P. B.

FIELD OPERATIONS OF THE BUREAU OF SOILS, 1903, BY MILTON WHITNEY, CHIEF.—With many accompanying papers, and an extended series of maps in case. This large volume of over 1,300 pages, with the maps, constitutes the fifth report of this Bureau. The following facts are taken from Mr. Whitney's brief preliminary report. Representatives of the Bureau have organized soil-survey work in the Philippine Islands. Forty-five men are in the actual work of soil-survey, nearly all of such experience as to be in charge of parties. Work has been carried on for the whole year by assignment to southern areas during the winter. Nearly thirty-five thousand square miles had been surveyed before 1903, and more than twenty-six thousand miles were added during that year. Work was done in nearly forty States and Territories, and the average cost was $2.22 per square mile. In a number of cases the

work has been done in co-operation with State or local organizations, including experiment stations in Illinois, Louisiana, and South Dakota, the geological survey of Maryland, and Cornell University. By a new plan of publication advance sheets of separate papers are made locally available in large numbers, saving the waste of distributing widely so bulky a report. Prospective settlers, land and loan institutions, insurance companies, and schools are making increasing use of these reports. The papers included are interesting studies of particular localities, and, in addition to a description of the soils, give much information as to the agriculture, physiography, climate, history, and economic conditions of the several areas. A. P. B.

ASIA.

RAILROAD PROBLEMS IN CENTRAL CHINA.—Lieut. Col. C. C. Manifold, of the British army, shows in the *Geographical Journal* for June some important phases of the railroad projects in central China. The paper describes his journey in 1904, when he examined parts of the lower Yangtze provinces east of Sechwan, the largest and wealthiest of the provinces of China, together with a large part of the Han River valley and the region between it and eastern Sechwan, which has hitherto been little known. This investigation was carried out to ascertain whether this region might afford a route by which adequate communications could be opened between the outer world and Sechwan, with its population of about 50,000,000.

He found that the railroad from Peking to Hankow on the Yangtze River is now completed, except for the interruption at the Yellow River, which is still unbridged, and is likely to be so for some years, as the work will be a large undertaking. Passengers are now booked through on this route from Peking to the Yangtze, the Chinese are taking readily to the road as a means of freightage, and it has already begun to pay a profit. He says the Chinese are beginning to welcome the idea of railroads. Between this road and the navigable eastern tributaries of the Han the only means of transport now used is the wheelbarrow, which is by no means to be despised. One man carries in his barrow as much as 350 pounds, or double the weight that the Government pack mule is allowed to carry in India; and he transports this weight from 12 to 20 miles a day.

Lao-ho-ku is the most important trading centre on the Han above Hankow, for it is the head of navigation for large junks. Goods are from 14 to 28 days making this journey of 300 miles from Hankow. The average depth of water is about $3\frac{1}{2}$ feet, and steam navigation on the Han is not likely to be successful for more than 100 miles, except in the most favourable stages of water. Wholesale dealers in foreign cottons at Lao-ho-ku are said to do a business of 10,000,000 taels a year, and there is also a large trade in varnish oil sent to Japan, and in general goods. This important town was not generally marked, even on the best atlas sheets, previous to 1901.

Most of the country between the Han and the Yangtze Rivers has been found to be filled with mountain ranges, barren and sterile, but with very large populations in the narrow valleys, where the soil is cultivated with extreme care. Much grain is imported in exchange for paper, which is a large manufacture. The rivers are of little commercial value, but there is much coal in the valleys, and American, Belgian, and French engineers have visited these districts to study the prospects. Col. Manifold says that the country from Lao-ho-ku west to Chu-shan in this region will afford a practical alignment for a railroad into the heart of this coal region. The railroad will probably be built if the prospects warrant it.

The expedition travelled over 300 miles through this very mountainous country,

and at present the prospects are very poor that a practicable railroad route will be found through these mountains to eastern Sechwan. Col. Manifold does not name the route which he recommends as most feasible for a railroad from eastern China into Sechwan, but he speaks of the road as destined to enter that province from the lower Yangtze, and says that Chungking, the commercial metropolis of Sechwan, must be the first objective of the road.

The Chinese provincial authorities told him they wished to undertake all future railroad construction themselves, with wholly Chinese capital and management—an ambition which Col. Manifold thought could not be fulfilled. The parties which Col. Manifold has led in the past four years have surveyed 8,000 miles of routes, and mapped them on a scale of 2 miles to an inch. When it is deemed expedient to publish the information this map contains it will be printed on a reduced scale.

STOCK-RAISING IN CHINA.—The industry of stock-raising for food purposes is almost unknown in China. Flesh is rarely eaten. Fish on the coast and along the rivers is extensively used. Pork, and locally poultry, are the chief meats eaten in the interior.

In the province of Chehkiang pork retails at 9 cents (gold), mutton at 6½ cents, and beef at 5 cents per pound. While this is cheaper than with us, it must be borne in mind that 10–12 cents (gold) per day is a very good wage in China.

The consumption of beef and mutton is increasing, however, and the supply is decreasing, with a corresponding rise in prices. Vice-Consul F. D. Cloud of Hangchau is authority for the statement that the scarcity of stock is only due to a failure on the part of the people to appropriate the hill grasses, He says there are "thousands of acres of hill land in Chehkiang alone covered all the year with luxuriant grass," that this nutritious food is "in a mild, favorable climate and easily accessible," but it goes to waste. There is here an industry to be developed.—(*Monthly Consular Report, May, 1905.*) G. D. H.

THREE SWISS INDUSTRIES.—Switzerland is a country well enough watered to be clothed with rich grass; hence grazing, and especially stock-raising for dairy products, has grown to be a great industry. 740,000 cows, yielding a milk product of $44,000,000, feed on the mountain slopes, and 56 per cent. of this milk is converted into condensed milk, cheese, and butter. The cheese is made in about 2,000 small factories scattered all through the mountain valleys. Its export in 1903 was valued at $8,000,000. This does not include the considerable amount of cheese made from goats' and sheep's milk.

Another industry established, in part, upon grazing, is that of chocolate and milk chocolate making. In 1903 over $2,000,000 worth of chocolate and shells imported from Colombia, Brazil, and Central America was manufactured into these sweets, and over 4½ million dollars' worth of the product was exported.

The third characteristic industry is that of watchmaking. About 25,000 persons are employed in the Swiss watch factories, and several more thousand make watches in their own homes. The centre of this industry is now in the Berne district, which contains two-thirds of the factory hands and three-fourths of the factories. The export of the product—watches and watch parts—amounted, in 1902 and in 1903, to about $23,000,000 each year.—(*Consular Report, May, '05.*) G. D. H.

POLAR.

AMUNDSEN'S EXPEDITION.—The recent report that Amundsen was expected soon to reach San Francisco through Bering Strait had no other foundation than the fact that the whaling fleet had been requested to carry some supplies to the Arctic

coast of Alaska and to the Mackenzie delta for his use, in case he should succeed in making the northwest passage. It was well known before he left Europe for the region of the Magnetic North Pole that he desired, after relocating the Pole and completing his studies of terrestrial magnetism in that region, to make the northwest passage in his small vessel, the *Gjöa*, if possible, coming out at Bering-Strait. It has been thought that this may possibly be done, in favourable seasons, by hugging the coast of the mainland rather closely, and thus avoiding the heavy ice north of the islands along the shore. Nansen expresses the belief that it may be possible for Amundsen to make this journey; and Sir Clements R. Markham said, in his last annual address before the Royal Geographical Society:

> It is not impossible that he may make the northwest passage. Such a gallant attempt deserves success, and I hope my friend Amundsen may attain his heart's desire.

GENERAL.

ECLIPSE OF THE SUN EXPEDITION.—The expeditions sent out by the United States Government to observe the eclipse of the sun at Bona, Algeria, and Valencia, Spain, on Aug. 29, were carried to Spain on the U. S. cruiser *Minneapolis*. The instruments and materials for the observ ation stations were transported by the auxiliary cruiser *Dixie* and the collier *Cæsar*. The expedition was in charge of Rear-Admiral Colby M. Chester, Superintendent of the U. S. Naval Observatory.

THE NEWARK (TRIASSIC) TRAPS.—During the past summer Prof. J. Volney Lewis, of Rutgers College, has made for the State Geological Survey a special investigation of the petrography of the Newark (Triassic) traps of New Jersey.

DR. G. D. HUBBARD GOES TO THE OHIO STATE UNIVERSITY.—G. D. Hubbard, Ph.D., who has been instructor at Cornell University in Physical Geography and Geology, has been appointed Assistant Professor of Geology at the Ohio State University, Columbus. He will also take charge of the geography work, and it is hoped that a group of courses in that study will be built up in the University.

EXPLORATIONS OF THE ATMOSPHERE.—The Blue Hill Observatory continued its studies of the upper air by means of balloons, at St. Louis, during the first three months of this year. The experiments were conducted by Mr. Clayton under the direction of Mr. Rotch. Nine more ascents were made and every balloon but one was found, and, with the attached instruments, returned to Blue Hill. The German expanding balloons, with French self-recording instruments, were used. All the balloons fell within the eastern half of a circle having its centre at St. Louis and a radius of 285 miles. On January 25, with a high barometric pressure at the ground, a temperature of $-111°$ F. was recorded at a height of 48,700 feet, this being one of the lowest natural temperatures ever observed. The experiments were so successful that Prof. Langley, Secretary of the Smithsonian Institution, granted Mr. Rotch $1,000 from the Hodgkins Fund to continue them this summer at St. Louis, in charge of Mr. Fergusson of the Blue Hill Observatory.

Soundings of the atmosphere, made at different seasons, should reveal the annual variation of temperature at great heights above the American continent, which is at present unknown.

Kites are regularly sent up at Blue Hill on the days fixed by the International Committee, and they are also being employed to ascertain the conditions above the Atlantic Ocean in the trade-wind region. Mr. L. Teisserenc de Bort, the well-known French meteorologist, placed his steam yacht at the service of Mr. Rotch, the latter sharing the expense of the cruise. Mr. Clayton, accordingly, left this country on

June 3 to meet the yacht *Otaria*, of 350 tons, at Gibraltar, and then go south, touching at Madeira and the Canary and Cape Verde Islands, and, perhaps, on to St. Paul, near the Equator, returning by a more westerly course to the Azores, the voyage occupying six weeks. The northeast trade-winds and doldrums will be traversed and the southeast trades entered. It is hoped that all the strata up to a height of 15,000 feet or more will be penetrated, so that their condition as regards temperature, moisture, and wind may be investigated.

The depth of the northeast trade-wind will be investigated and the supposed southwest or return trade, which has been observed only on the Peak of Teneriffe, will be sought and its height above the ocean, in different latitudes, measured. In case the kites do not reach a sufficient altitude, small balloons will be liberated from Madeira and their change of direction will be observed as they rise.—(Condensed from *Science*, No. 550.)

Transplanting Aquatic Food Animals.—A very important line of work which our Fish Commission is carrying on is the transplanting of aquatic food animals into waters to which they are not indigenous. The *Report* of the Commission for 1903 mentions two very successful instances of the acclimatization of native fishes. About 30 years ago the shad and the striped bass of the Atlantic coast were introduced on the Pacific coast; the slender colonies became established, flourished, extended themselves widely, and multiplied to such an extent that these two species now rank among the leading food fishes of the Pacific States, and in some places exist, perhaps, in greater abundance than in any waters on the Atlantic coast. The total cost of planting these fish on the Pacific coast was less than $5,000. The aggregate catch to the end of 1902 was 18,900,000 pounds, worth $670,000. The marine establishments of the Commission have for years been hatching cod in large numbers on the north Atlantic coast, with the result that since 1889 a very lucrative shore cod fishery has been kept up on grounds that were entirely depleted, or had contained only few cod. The Commission is thus proving that the effects of human improvidence may be counteracted by man's ingenuity and ability to aid nature.

PERSONAL.

Dr. Franz Boas has resigned the curatorship of the Anthropological Department of the American Museum of Natural History. He is still connected with the Museum, however, and will conduct the researches and publications of the Jesup North Pacific Expedition and of the East Asiatic Committee.

Mr. Jacob Schiff, of New York, has presented $50,000 to Harvard University, to be devoted to exploration in Palestine.

At the annual meeting of the Royal Geographical Society, in May, Sir George D. T. Goldie was chosen to succeed Sir Clements Markham as President of the Society. The new president has travelled extensively in Africa, especially in the Niger regions, is regarded as an expert on Niger questions, and was the founder of the British Protectorate of Nigeria. The annual dinner of the Society was really a complimentary banquet to the retiring president, who devoted himself with the greatest energy to the interests of geography and the affairs of the Society during his long administration. Messages of regret upon the retirement of Sir Clements Markham were read from the King and the Prince of Wales.

NEW MAPS.

AFRICA.

EGYPT.—Carte du Lit du Nil entre Chellal et Assouan. Scale, 2,130 feet to an inch. Par R. Fourtau. *Bull. de la Soc. Khédiv. de Géog.*, Series 6, No. 7. Cairo, 1905.

Based upon the Government surveys, the map shows the primary and secondary faultings and the principal bars, exposed at low water; also a profile of the chief channel of the Nile between the upper bars of Bab-el-Kibir and Bab-el-Madaik, in the cataract so called. The topography on both sides of the river is sketched. The map illustrates a monograph by Mr. Fourtau, a French geologist and civil engineer, whose duties as an engineer called him to Assuan, where he improved the opportunity to study the physical geography of the cataract. He says that the torrential action of the Nile waters produces scarcely any effect in wearing away the rocks, excepting at the bends of the channel below the cataract, and that the actual condition of the Nile bed between Chellal and Assuan may be ascribed to a series of faults that are plainly recognizable. The historic monuments show that the Assuan cataract has not been sensibly modified by the work of running water for the last 6,000 years—a fact that is to be attributed to the dissolving of the feldspar in the granite and its replacement by silicates of iron-manganese, that are insoluble under the conditions which decompose the feldspar.

GERMAN EAST AFRICA.—Karte von Deutsch-Ostafrika in 29 Blatt und 6 Ansatzstücken. (Sheets G 4 and H 4 Ssongea and F 4 Gawiro.) Scale, 1:300,000, or 4.73 statute miles to an inch. Unter Leitung von Paul Sprigade und Max Moisel. Dietrich Reimer (Ernst Vohsen), Berlin, 1904.

The publication of this important work began in October, 1895, about ten years before the two sheets named above were issued. When we compare these sheets with "A 1. Kivu-See," the first to be published, we are impressed with the vast accumulation of material for map-making within the past decade. "Kivu-See" sheet contained the work of only five or six travellers, and was greatly lacking in detail and accuracy. It is valuable now chiefly as a record of what was known ten years ago of the region of active and extinct volcanoes in German East Africa. The Ssongea and Gawiro sheets, the latest to be issued, show the southern part of the German coasts on Lake Nyasa and the colony to the east of the lake as far as 36° E. Long. The compilers of the Ssongea sheet had before them the work done by explorers and surveyors on 31 routes in this district, and the mother maps they produced along these routes numbered 268 sheets. The latitude and longitude of eight places in this small district were available for their use, and they were able to place on their map much information concerning the forms of the physical features. A few more sheets will complete the whole map, and a revision of the first half of it will then be required immediately, if the map is to be kept up to date.

GERMAN EAST AFRICA.—Die Eisenbahn Dar-es-Ssalam-Morogoro. Scale, 1:600,000, or 9.4 statute miles to an inch. *Deutsche Rund. f. Geog. u. Stat.* Vol. 27, No. 7. A. Hartleben's Verlag, Vienna, 1905.

Shows (black) the first survey for this railroad, and (red) the later and more northerly survey which has been adopted. The railroad will extend inland from Dar-es-

Salam, the capital of German East Africa, to the west side of the Ulugara Mountains, whose minerals are said to be worth exploiting. There is a comparatively large population for the first fifty miles to and across the valley of the Kilgani River. This coastal zone may be the limit of the possibilities of large agricultural development. It is believed that the railroad will develop in this zone the plantation-raising of cotton and other fibres and oil plants. The map is a good one, and gives some facts relating to varieties of vegetation, geology, etc. The length of the road will be 230 kilometers, the gauge one meter, and the East Africa R.R. Co. says it will complete the road in two years, though its contract with the Government gives the Company five years. The Company is to receive as its property a strip 100 kilometers wide to the right and left of the line. Early this year a long pier was extended into the bay at Dar-es-Salam to facilitate the landing of railroad supplies.

NORTHERN NIGERIA.—Map of the Nigeria-Kamerun Boundary Survey. Scale, 1:1,500,000, or 23.7 statute miles to an inch. *The Geog. Jour.*, July, 1905, London.

Illustrates a paper by Col. L. Jackson of the British Commission. A line about 32 miles long, between Mount Bagele and Beruere, extending approximately east and west, was the base for the triangulation carried from Yola, on the Benue River, to Lake Chad. Both the British and German commissioners carried out triangulations, the results of which differed at Kukawa, the northern terminus, by 11 seconds of latitude and longitude. The work of delimiting the boundary occupied about ten months of 1902.

AMERICA.

CANADA.—Yukon Territory (Kluane, White, and Alsek Rivers). From surveys by the International Boundary Commission, 1893–95; J. J. McArthur, 1900; A. C. Talbot, 1899, and J. B. Tyrrell, 1898. Scale, 1:400,000, or 6.32 statute miles to an inch. Department of the Interior, James White, Geographer, Ottawa, 1905.

This large sheet includes only the southwest corner of the Yukon Territory. It indicates the culminating points (or nearly these points) of Mounts Seattle (10,000 feet), Hubbard (16,400), Vancouver (15,617), Cook (13,700), Augusta (14,000), and St. Elias (17,978), as on the boundary line between the United States and Canada. Relief features are shown by contours along the waterways mentioned and in the coast regions of Yakutat Bay and the southeastern glaciers of the Mount St. Elias system.

CANADA.—Standard Topographical Map (Ontario, Hamilton Sheet). Scale, 1:250,000, or 3.95 statute miles to an inch. Department of the Interior, James White, Geographer, Ottawa, 1905.

Another sheet of the fine large-scale map of Canada that is now being produced. It embraces the tongue of land between Lakes Ontario and Erie, in which contours of depth are shown for every ten fathoms.

CANADA.—Map of the Province of New Brunswick to Illustrate the Quality of its Soils. Scale, 32 statute miles to an inch. *Proc. and Trans.* of the Roy. Soc. of Canada, Second Series, Vol. 10. Ottawa, 1905.

A sketch map in which the excellence of the soil is approximately proportional to the depth of the shading, the best lands being black. The wearing out of thin soils in the south caused the abandonment of many settlements. The map is one of the illustrations in a monograph on "The Origins of Settlements in the Province of New Brunswick," by William F. Ganong.

2.—Map of the Province of New Brunswick to Illustrate the Historical Origin of its Settlements. Scale, 16 statute miles to an inch. With the same monograph.

A map in colours showing the distribution of the Indian Reserves, the French, the English, and other settlements.

3.—Map of the Province of New Brunswick to Illustrate its Physiographic Features. Scale, 16 statute miles to an inch. With the same monograph.

An excellent map, drawn by Mr. Ganong, based on the topographic survey and printed without names. The relief is shown by contour lines with 100-feet interval. All the waterfalls and the head of tide in the rivers are shown.

CHILE.—Estero Comau ó Leptepu. Scale, 1:120,000, or 1.8 statute miles to an inch. Oficina Hidrográfica, Valparaiso, 1905. (Price, $1.)

Black-and-white chart, with heights and soundings in meters, giving the results of the surveys of the Hydrographic Commission in 1900. The deep Comau Inlet was sounded throughout and the elevation of the most conspicuous mountains was ascertained. This part of the coast is separated from the north part of Chiloe I. by the Gulf of Ancud.

CHILE.—Puertos del Canal Cockburn, Tierra del Fuego. Puerto Barrow—scale, 1:5,000, or .07 statute mile to an inch, surveyed in 1901; Puerto Soffia—scale, 1:15,000, or 1,250 feet to an inch, surveyed in 1903. Hydrographic Office, Valparaiso, 1905. (Price, 50 cents.)

Charts of two new ports in the Cockburn Channel, one of the reaches used by ships passing into or out of Magellan Strait. These ports have not yet appeared on the latest atlas sheets.

UNITED STATES.—Preliminary Map of the Central Great Plains showing the Structure of the Dakota Sandstone. Scale, 40 statute miles to an inch. By N. H. Darton, U. S. Geol. Sur., Prof. Pap. No. 32. Washington, 1905.

Shows the outcrops of this sandstone and the vast area underlain by it. This water-bearing formation is usually overlain by thick masses of impermeable rocks; and as the water is under great pressure, this is one of the chief sources of artesian supplies.

UNITED STATES.—Preliminary Map of the Great Central Plains, showing the Economic Geology. Scale, 40 statute miles to an inch. By N. H. Darton, U. S. Geol. Sur., Prof. Pap. No. 32. Washington, 1904.

An excellent map, showing the distribution of the mineral and metal resources of the central great plains according to our present knowledge.

UNITED STATES.—Geological Atlas of the United States, No. 125. Rural Valley Folio, Pennsylvania. Washington, 1905.

This quadrangle, drained by the Allegheny and its tributaries, has important mineral resources, and the distribution of the coal mines and gas and oil wells is shown on the sheet of structure and economic geology.

ASIA.

CHINA.—Sketch Map of a Journey from Fu-chau to Kiu-kiang. Scale, 1:750,000, or 11.84 statute miles to an inch. By Major A. B. Hamilton. *The Geog. Jour.*, July, 1905, London.

The map is based on a sketching-board traverse, and the heights, in feet, are aneroid determinations. While the circumstances prevented the collection of exact data for a map, the product is of value as illustrating a route from the seaboard to the Yangtze Valley of which very little has been known.

PHILIPPINES.—Map of the Island of Luzon. Scale, 44 miles to an inch. Showing Railways. Fifth Ann. Rep. of the Philippine Commission, Part 3. Washington, 1905.

The map is photographed down from the larger map of the Bureau of Insular Affairs, is almost illegible without a magnifying glass, and has the serious disadvantage of using the same symbol to indicate completed railroads and also the boundaries of the provincial subdivisions. A person unacquainted with the facts might think that completed railroads were well distributed over Luzon, instead of being confined to one line between Manila and Dagupan.

EUROPE.

IBERIAN PENINSULA.—Germanische Völker und Ortsnamen auf der Pyrenäen-Halbinsel. Five maps founded upon No. 14 in the Spruner-Menke Histor. Handatlas. *Deutsche Erde.* Vol. 4, No. 2. Justus Perthes, Gotha, 1905.

Illustrates an article on German–Spanish place-names by Johannes Jungfer. The maps show the kingdoms of the Visigoths and other Teutonic peoples in the peninsula and the distribution over it of German place-names due to these invasions.

SWITZERLAND.—Carte Générale de la Suisse. Par H. Kümmerly. Scale: 1:400,000, or 6.3 statute miles to an inch. H. Kümmerly & Frey and A. Franke, Bern, 1904 (?).

A well-drawn and attractive map in colours, with relief brought out by shading and oblique illumination, the effect being artistic and panoramic. The light and dark effects are so handled in most cases as to give a clear definition of the topographic forms. This information is accompanied by plainly-printed nomenclature, hydrography, railroads, tunnels, highways, castles, ruins, etc., the whole making one of the fullest and best maps of Switzerland produced on this scale. An index accompanies the map.

UNITED KINGDOM.—River Mersey from Rock Lighthouse to Eastham and Garston. Scale, 1,200 feet to an inch. Henry Belam, Marine Surveyor, Mersey Docks and Harbour Board, Liverpool, 1901.

UNITED KINGDOM.—Liverpool Bay. Scale, 3,150 feet to an inch. Surveyed by the Marine Surveyor of the Mersey Docks and Harbour Board, Liverpool, 1904.

The chart of the Mersey has soundings in feet and inches, figures showing depths below and heights above the datum line. It shows in what parts of the river pilotage is compulsory, where vessels may not be loaded or discharged without special permit, etc. The chart of Liverpool Bay, issued annually, is accompanied by tides reduction tables and notes on the methods of using the tables.

THE OCEANS.

NORTH PACIFIC.—Drift of the disabled S. S. Carlisle, Nov. 5, 1904–Jan. 25, 1905. *Bulletin* of the Philippine Weather Bureau, Dec., 1904, Manila.

This disabled steamer wandered at the mercy of the winds and waves for two months and twenty days. The map of the long journey is published because the track of the *Carlisle* gives an excellent opportunity to study the air currents in that zone of the Pacific embraced by Japan on the north, the Ladrones on the east, and the Philippines on the west. The drift began about 500 miles east of Northern Nippon, and its general direction, with frequent variations for a few days, was west, east of south, and south of west, to San Miguel Bay, on the east coast of Luzon.

PILOT CHART OF THE NORTH PACIFIC OCEAN FOR AUGUST, 1905.—Hydrographic Office, Washington. (Price, 10 cents.)

The Hydrographic Office warns mariners not to place too much reliance upon predictions concerning currents near the Aleutian Islands and in Bering Sea, as information is meagre. For more than a year each issue of this Pilot Chart has contained the statement that the fishing banks shown in red "were tabulated and described in several previous issues of the Pilot Chart." It would serve the convenience of persons seeking this information if the above statement might be replaced by reference to one or more numbers of the Chart containing the tables and description referred to.

BOOK NOTICES.

Josias Simler et les Origines de l'Alpinisme jusqu'en 1600, par W. A. B. Coolidge. Avec Illustrations et Carte. Grenoble, Allier Frères, 1904. Large 8vo.

The voluminous work bearing this title stood in need of the explanation set forth in its preface. Few persons not widely read in the national literature of Switzerland have ever heard of Josias Simler, the patriotic Zurich professor and author, of the sixteenth century; again, the second part of the title—The Beginnings of Mountaineering Down to the Year 1600 (if for the moment we may be permitted to translate "*alpinisme*" by a familiar word)—causes a start of natural surprise when connected with a work of over a thousand pages. The passion for scaling mountains is generally held to be too recent to possess such traditions, and, really, it has had none until a comparatively late day, when certain of the more scholarly devotees of a sport which is pre-eminently the sport of intellectual men have conducted researches through the classic literature of the ages, as well as through much still unedited. The acme and sum of many such labours appear in the monumental work before us.

Rev. W. A. B. Coolidge—an American by birth, a Briton by education, a Frenchman (and particularly a Dauphinois) by adoption—is its responsible author. A member of several Continental alpine clubs, a founder of the active *Société des Touristes du Dauphiné*, the author of valuable guide-books for that land of superb mountains, as well as for the neighbouring regions of the Swiss Alps, and—best of all requisite endowments!—inspired with an unfailing and enlightened enthusiasm for the mountain in general, a more competent editor for such a work could hardly be found. But the enthusiasm and leisure of a single man would have been unequal to the task of bringing out a work of this character, even though "begun in 1895 and zealously pushed from 1899 to 1903," had he not secured the collaboration of numerous gentlemen—French, English, Swiss, and Italian—who have aided in the extensive research necessary to determine many questions of fact in varied fields of inquiry.

Josias Simler (1530–1576), trained for the Protestant pulpit, but from his thirtieth year Professor of Old Testament Exegesis in the École Caroline at Zurich, was pleased to vary his theological activities with studies relating to the history of his native land, familiarizing himself, among other sources, with the extensive *Chronik* of Johannes Stumpf, which appeared written in German in 1548. Simler conceived the idea of preparing an enlarged edition of this work, and in Latin, "in order to make known to foreigners unfamiliar with German the history and institutions of Switzerland, as also its scenic beauties." The scheme grew under his hands,

numerous collaborators were engaged with him more or less continuously; but failing health prevented the completion of his master-work. In 1574, for the purpose of winning new collaborators and to interest the general public in the forthcoming larger work, he issued as a sample the portion relating to a single canton, Valais, to which he appended a special treatise of some three hundred pages on the Alps, "Valais being *par excellence* an alpine district among whose mountains many things of interest and beauty are to be seen." This appendix, under the title "*De Alpibus Commentarius*," passed through several editions, two (possibly three) independently in 1574, 1633, and 1635 (?); again, in 1735, it appeared, forming one of a collection of brief essays concerning Switzerland. This Commentary it is which forms the nucleus of the weighty volume before us, embedded with its 307 pages—the Latin original, faced with a translation into peculiarly current French—in the midst of the thousand pages that go to make up the entire work.

Following the plan of the original text, the editor has divided Simler's work into twenty chapters, placing as headings the marginal rubrics of the original: The Name "Alps"; their Geographical Extent; Silius Italicus' Description; Early Passages; Hannibal's Passage; The Cottians; Graians; Pennines; Highest Alps (*De Summis Alpibus*); Lepontines; Rhætian Alps; Julian and Carnic Alps; Difficulties and Dangers; Peoples; Hydrography; Minerals and Metals; Trees; Shrubs and Plants; Fauna. The work, doubtless, comprehends all that was known, or supposed to be known, to the sixteenth century concerning the land that was destined to become, three hundred years later, the most attractive country in the habitable world to the student of natural science and the tourist. Hence the charm of the old treatise, which in 1895 inspired two friends (the author and M. Felix Perrin, his principal collaborator, while engaged in a "high tour" in which they had crossed one of the historic snow-passes described in Simler's work) to pledge themselves to publish it once more and in a modern tongue, curiously enough for the very reason that had led Simler to do Stumpf's Chronik into Latin—in order to secure for it a wider reading among "those who know!"

Now, about this treatise and its transcription as a "*noyau*"—one is tempted to suggest rather "*moyeu*" (nave or hub)—are gathered, or from it diverge, a variety of treatises more or less germane, which enter as elements into the author's conception of "alpinism." Mr. Coolidge defines the word thus: "All that relates to ascents of lofty peaks or the traversing of high snow-passes." He then adds:

> To the average mind an up-to-date alpinist is only a climber, fain to roam over lofty ranges, and devoting himself primarily to the physical pleasure of arduous and dangerous climbing feats, though from time to time, as a secondary consideration, he may become interested in the history of the Alps, their inhabitants, or the scientific and other questions relating thereto. In this restricted sense the word is used in a single section (C) of our Introduction.

In general, he uses the word "in its etymological and extended signification to define '*la science des Alpes*,' thus embracing everything nearly or remotely concerning the Alps." To cover the whole of his work he would have to go farther and say "touching all known mountain regions," for some of the interesting facts here collated have to do with regions well outside the Swiss and French Alps.

Only with this broadened definition could the conjunction of the name of Simler and the history of alpinism escape the charge of incongruity, for poor Simler, "from the age of twenty-nine a victim of the gout and other maladies," probably knew little or nothing at first hand of what he reported from the high altitudes. The sole passage in all his works which apparently alludes to a personal experience upon the mountains is the description of the glorious spectacle of an Alpine sunrise witnessed from some high point.

Mr. Coolidge concludes, however, that, if it really be such, it refers either to Simler's experience in some ascent made before he was fourteen years old to a hill-top near his native village, or, later, to heights in the immediate vicinity of Zurich—in any event, to no truly Alpine peak. He has, however, "risen above his contemporaries by editing an Alpine Encyclopedia, and so has deserved well of all those, climbers or not, who regard the Alps as the finest region on earth."

Vindicating thus Simler's title to regard as the father of modern mountaineering, the author does not hesitate to gather about the *Commentary* all that was known, and, so far as it has been discovered, all that was thought, about mountain ascents previous to the year 1600.

In the forefront is set the now famous letter of Dr. Conrad Gesner to his friend Avienus (Jacob Vogel) on "The Love of Mountains" (*De Montium Admiratione*), written in 1541—"a letter constituting one of the charters of alpinism"—reproduced in the original Latin and in translation. The "Introduction" (190 pages) consists, first, of an historical sketch of mountaineering under three sub-titles: (A) Ascents of peaks; (B) Traversings of snow-passes; (C) Practical Mountaineering. Under C are discussed (1) the mountain *per se;* (2) the mountaineer upon his peak, with subdivisions: (*a*) his implements, (*b*) his amusements ("fantaisies"), glissading, name-carving (for, alas! this whim dates back beyond 1555), tobogganing, rolling down rocks, and blowing on Alpine horns, and (*c*) his guides—a chapter naturally much resembling that on "Snakes in Iceland." As a specimen of the interesting facts collated, we may mention the following: "Originally alpine horns were used by the herdsmen in chanting their prayers; this custom still exists in châlets on the slopes of the Pilatus range."

Section A presents, doubtless, the most complete register to be consulted of ascents in the Alps previous to 1600. Yet of even greater interest are the original documents, eighteen in number, from which our knowledge of these expeditions is derived. First in order is the page from Livy describing the ascent of the Hæmus (9,300 feet) in the Balkan Peninsula, made by Philip V. of Macedon in 181 B.C. Among those that follow are the full text of a long Latin letter of Petrarch, describing his ascent of Mont Ventoux in 1336, and his emotions and religious meditations on that occasion; the ascent in 1492 of "le Mont Inaccessible," as it was named and believed to be, Mont-Aiguille, near Grenoble, by the Seigneur de Dompjulien, by order of the sovereign, King Charles VIII. (this is the first recorded ascent of a really audacious character accomplished by the aid of "*subtilz engins*," ladders, and the like); again, a brief note by Leonardo da Vinci touching the phenomena observed by this versatile genius in his ascent of Monte Bô (8,520 feet), made about the year 1511.

The remaining portions of the book are devoted to a biographical sketch of Simler, and to elaborate and most interesting notes both on the Commentary itself and on the annexed documents. To these, although they represent, doubtless, the most exacting and laborious work involved in this monumental publication, we can merely allude in passing. Reproductions of portraits of Simler, Gesner, Tschudi, and Stumpf from contemporary sources, the facsimile of a letter written from the summit of Mont-Aiguille by Dompjulien to the President of the Parliament of Grenoble, a map of the Bernese Oberland dating from 1578, and a few other interesting illustrations, twelve in all, add to the value of this notable volume. C. E. F.

XX., XXI., XXII. u XXIII. Jahresbericht (1901, 1902, 1903 u. 1904) des württembergischen Vereins für Handelsgeographie. Stuttgart, 1905.

The contents of this report on the work of the Society during the period embraced

by the first four years of this century are interesting. Leaving aside the official sections, we meet with three papers (lectures), all of which can be sincerely commended. The first one is of less direct interest on this side of the Atlantic than the others, treating, as it does, of Bosnian forests and Bosnian cultivated areas, but the style of writing of its author, Dr. Vogel of Stuttgart, is pleasing and, to a fair extent, plastic, and it conveys much interesting information on parts of Bosnia comparatively little known.

The second: Impressions of Travel from the Department of Ancachs in Peru, by Dr. Hugo Debach at Schaffhausen, is even more attractively written. The Department of Ancachs is famous for its mines, and its orography was hitherto only known through the work of Raimondi: "*El Departamento de Ancachs y sus Riquezas minerales*" (Lima, 1873), and especially by the map accompanying it. Dr. Debach well characterizes the two important mountain chains that traverse the greatest part of the Department from north to south (approximately), and parallel to each other, the *Cordillera negra*, or coast range, and the *Cordillera blanca*, farther inland, a towering snow-clad chain, the summits of which attain an elevation of as many as 22,000 feet. The great abruptness of the former towards the east is a feature not met with in all the sections of the Peruvian coast range. Dr. Debach's landscape pictures are pleasing to read, although (as German literature of a modern date in general) they are still far from the well-tempered poetry, coupled with accurate description, peculiar to the style of Humboldt and Gustav Radde. Ethnography, of course, enters into the frame, and it is only to be regretted that the author knows the Indian so little, and looks at his past through the eye-glasses of ordinary school routine. It is a very commendable effort, however—the more so as it it places before us pictures of a region little known to the general public.

The lecture by Dr. A. Hahl on the geography of the German colonial area of New Guinea concerns us more directly, as treating of clusters of islands in the vicinity of our Philippines. A cursory glance at these groups, like the Carolines, Marianas, and others, it still is well worthy of careful reading. The ethnographic picture is somewhat confused, and the linguistic part of it attempts subdivisions, with technical terms perhaps too technical for the general public.

Very valuable are the reviews of a number of other lectures given at the Society's meetings in the four years referred to above. They enable the reader to form a very clear idea of their contents, testifying to the scrupulous care with which every review has been prepared. A. F. B.

The Maintenance of Health in the Tropics. By W. J. Simpson, M.D. viii and 118 pp. and 14 Illustrations. John Bale, Sons & Danielsson, Ltd., London, 1905. (Price, 2s. 6d.)

Dr. Simpson wrote this Handbook at the request of the London School of Tropical Medicine, and it was published under their auspices. It deals with tropical hygiene in a simple and popular manner, treats of the characteristic diseases of the tropics, and gives special prominence to prevention and to protection against deleterious influences. The longest chapter is given to malarial fever and protection against the bites of mosquitoes. An important reduction in the rate of mortality among natives of the temperate zone living in the tropics has been observed for some years past. Medical men say this is due to the better knowledge acquired in the past two decades as to the hygiene to be observed in the equatorial regions. This book, written in the light of long experience, will be useful to those residing in or visiting the tropics.

Türkei, Rumänien, Serbien, Bulgarien. (Sechste Auflage.) xii and 384 pp., 10 Maps, 30 Plans, 1 Panorama, 2 Views, and Index. Bibliographisches Institut, Leipzig, 1902. (Price, M. 7.50.)

This is one of the Meyer series of Eastern guide-books, the other three covering Greece and Asia Minor, Egypt and Palestine, and Syria. The extension of railroads through the Balkan States has stimulated pleasure travel in that direction, and such a book, prepared with the painstaking care for which the long series of Meyer Guide-books is noted, is a necessity of the journey. Large regions in these States are not treated, because the book is confined to those routes where the tourist may travel without danger and with comfort. The work is uncommonly interesting for a guide-book, because the reader is introduced to so many unaccustomed phases of life and development. Museums and picture galleries naturally are not conspicuous in these pages, but all the important cities are well mapped, and their points of interest, the excursions from them, and the striking views, historic spots, and buildings along the railroad are indicated. The maps are an especially good feature, and Constantinople is described, from the tourist's point of view, with great thoroughness, about a third of the book being given to that city.

Stanley, Le Roi des Explorateurs, par Joseph Joûbert (1840-1904). 54 pp. Germain et G. Grassin, Imprimeurs-Editeurs. Angers, 1905.

In these well-written pages the praises of the hero are so ingeniously mingled with irony and sarcasm that the author seems to be facing two ways at once.

The King of Explorers is introduced as a majestic menhir rising high above the megalithic line of men. He is compared to Alexander the Great, Aristotle, Copernicus, Cuvier, Champollion, Edison, Goethe, Napoleon I., and Pasteur! The range is wide. We are told what Stanley might have been if he had lived four centuries ago, but nothing is said of what he is to be in the year 2,300—an omission which M. Joûbert should not overlook in a second edition of his pamphlet.

The sketch of Stanley's career, so far as this can be followed through the mazes of the author's eloquence, is familiar enough; but there is nothing to show why this familiar story should have been told once more. There is, indeed, an appearance of originality in the comparisons introduced, but these would have gained in brevity and in vigour if they had been summed up in the formula: "Let us compare him to everybody."

On the whole, the Book of Ecclesiastes is not sufficiently studied.

The Traveler's Handbook. A Manual for Transatlantic Tourists. Compiled by Josephine Tozier. xv and 211 pp. Funk & Wagnalls Company, New York, 1905.

Suggestions, information, and advice concerning travel in Europe and the ocean voyage, clearly written and well arranged. The book covers a thousand-and-one minutiæ relating to preparation for the journey—the ocean liners, life on board ship, seasickness, fees; in fact, all the detail that becomes mere routine to the experienced traveller, but often involves others in annoyance and perplexity. Two chapters are given to England, one each to Germany, France, The Netherlands, Italy, and Egypt, with a great deal of general information about travel on the Continent and the return voyage. He who acquires all his travel-lore by personal experience pays a high price for it, and many suggestions in this little book will conduce to comfort and money-saving. The book covers the whole subject, is accurate, and one of the best of its kind.

Nordafrikanische Touristenfahrten (Algerien, Tunisien, Tanger). Von Curt v. Zelau. (148 pp. and 35 Illustrations from photographs.) Verlag von Gebrüder Jänecke, Hannover, 1904. (Price, M. 3.)

The volume contains much pleasant description, facts, and opinions as to the condition of the people and the influence and benefits of French rule, and a great deal of information of use to other travellers in the same region. Visitors to Biskra may now gain some experience in desert life by camel journeys to neighbouring oases.

The Jordan Valley and Petra. By William Libbey, Sc.D., and Franklin E. Hoskins, D.D. Two Vols. Vol. I, xv and 353 pp., and 74 Illustrations. Vol. II, viii and 380 pp., 85 Illustrations, 7 Appendices, Index, and Map. G. P. Putnam's Sons, New York, 1905.

For several reasons these handsome volumes are among the most noteworthy of recent additions to geographical literature. As the work is the narrative of a journey in the Jordan Valley, and the study especially of the eastern part of it, and of the physical conditions, the life, and the ruins of the mountain edge of the desert plateau beyond the valley, the reader is taken almost from the outset into regions that few modern travellers have seen and among monuments of some of the older chapters in human history. But the journey is extended still farther south to scenes that the Exodus made familiar to the Hebrews—to the fields where they fought with the Moabites and Edomites, to the wonderland around the ancient city of Petra, and to that city itself, where the East and West once met to barter, and which is unique among all the great sights of the world.

The work thus treats of the uncommon, and its ample pages contain much of interest for several classes of readers. Its contributions to the geology of that region will command attention, and the book enlarges our knowledge of the town dwellers and nomads living under Turkish rule, almost cut off from intercourse with the outer world. In some instances there is no doubt that the comment in this work on little-known scenes of Biblical history here described may be helpfully read in connection with the ancient narrative.

The perfected modern camera, skilfully handled, has at last been called in to illumine this neglected corner of the earth. Prof. Libbey has made many fine photographs in various parts of the world, but his Arctic, west American, and Hawaiian views are excelled, if anything, by this large series of pictures, caught in the dry air of an Oriental steppe region, clearly and sharply defining the ruins of old cities, temples, and theatres, the towns of to-day, the nomads, the cave dwellers, the cañons, valleys and sand plateaux, and many other aspects of the old-new country that will help to strengthen the impression made by the descriptive text upon the memory. The illustrations are certainly a very remarkable feature of this book.

Mr. Libbey, who occupies the Chair of Physical Geography at Princeton, fortunately had as his co-worker on this journey Dr. Hoskins of the Beirut Mission, who, in twenty years, had become well acquainted with the land and people of the more accessible part of this Turkish domain, and also knew Arabic and the Government officials. These advantages secured aid and favour that made the trip possible, and the journey of over 600 miles on horseback was without an accident. The authors are all the more to be congratulated because the Turkish Government has for many years refused to allow travellers to use the pilgrim road east of the Jordan, on the ground that it was not safe.

Prof. Libbey says:

The mountains east of the Jordan are not peaks, though peaks are found near Hermon and in the

Jaulan, but rather high table-lands, presenting an almost unbroken skyline to the observer west of the Jordan. For two centuries they have been shrouded in mystery almost impenetrable. During the last three decades they have begun to yield their secrets to the geographer, the geologist, the archæologist, the historian, and the traveller, and each of these departments of science has been treated to a series of brilliant surprises.

Along this "mysterious unbroken skyline" it has been found that most of the geographical names are the same as those recorded in the early part of the Bible. The region is proving a paradise for the student of the old civilizations that swept over it, strewing these ranges with ruins splendidly preserved to this day.

Among the objects described and photographed are the finest Crusader ruin extant at Kerak in Moab, one of the defences erected along the land frontier of the Holy Land to keep out the infidel; the mosaic map at Madeba, of parts of which ten photographic reproductions are shown; the magnificent ruins of Jerash, which the authors call the finest example of an ancient Greek city; the power of Rome as recorded in her military roads and camps, of which some of the best examples are on the plains of Moab and among the mountains of Edom; and the wonders of Petra, to a minute study of which 170 pages are given. Including the remarkable photographs that accompany this description, the authors have made a splendid addition to all that has been written and pictured concerning "one of the strangest, most beautiful, most enchanting spots upon the face of the earth."

Tht appendices give the itinerary and caravan time between halting-places; elevations taken from the mean of three aneroids; list of visitors to Petra during the past century; a description of the Hedjaz railroad project; explanation of the photographs of the mosaic map; and a list of Scripture references. There are also sixteen photographs of fossils which Prof. Libbey brought home, most of them embedded in large numbers in pieces of slab. A description, in twenty pages, of the fossils and rocks collected is written by Gilbert Van Ingen, Curator of Invertebrate Paleontology at Princeton University.

It is possible that a few years more may see this region more accessible to travellers. Later visitors are not likely to find more helpful suggestions for such a journey than in this book.

The Organization of Ocean Commerce. By J. Russell Smith, Ph.D. No. 17 of the series in "Political Economy and Public Law," published by The University of Pennsylvania. viii and 155 pp., 2 Appendices, Index, and Map. Philadelphia, 1905.

This is an investigation of one of the leading factors in economic geography. It was written for the general public and for students of commerce in high schools and colleges. The book has, in large part, grown out of the concrete studies of commercial activities which engaged Dr. Smith for many months while he was assisting the Isthmian Canal Commission in their rate and traffic investigations. During this work he examined many volumes of unpublished statistics in the Government bureaux and custom houses, corresponded extensively with steamship companies, importers, exporters, and manufacturers, and later carried out the same lines of inquiry in the leading ports of Europe.

The result of these studies at first hand and of the reading preparatory or incidental to them is this well-written, methodical discussion of the whole subject of ocean commerce. The types of vessels and the part of each in the ocean trade, whether chartered singly or run in lines of ships; ocean freight rates and comparison with railroad rates; trade routes for steamers and sailing vessels and their competition in the world's carrying trade; coal and coaling stations, Government control and supervision of shipping routes, the probable effects of the Panama Canal, questions

relating to harbours and ports and the handling of freight, are the topics of this book. The concluding chapter treats of the shortened routes, the greater safety of navigation, the alliance of steamship and railway, and other conditions that mark the present tendencies in commercial organization.

The principles of commerce, or, in other words, the philosophy of the subject, come into strong light in this presentment and discussion of the data. The following comparison between the coming Panama Canal and the Suez Canal is no surface treatment of the matter:

> The question of toll-rate is of especial importance in the management and traffic of the Panama Canal, because such a large proportion of its trade might be driven to other routes by high rates of toll. In this respect it is signally different from the Suez Canal. The American canal has four main fields from which and to which its commerce may come and go: Pacific North America, Pacific South America, eastern Asia and Australasia. Two of these four trade areas are upon the margin of the zone of canal influence. A high rate of toll might drive away completely the commerce of Australasia, most of the South American, and, if accompanied by low tolls at Suez, a considerable share of the Asiatic trade might also be lost to the American canal.
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> But a reduction of the Suez rate is highly improbable, because the reasons that prompt to low tolls for the Panama Canal, prompt to high tolls for the Suez. Of the traffic for this canal, a surprisingly small portion is upon the margin of its traffic zone, only the Australasian, and the greater part of that follows the Good Hope or Magellan routes. The great bulk of Suez traffic is bound to or from southern and eastern Asia, and the saving is so great that the shippers can afford to pay high tolls. If the tolls were raised one-third or one-half, nearly all of the traffic would at present continue to use the canal; and if the rate were reduced one-third or one-half there would be but slight gains in tonnage, certainly not enough to make up the loss in revenue.

No text-book can give so much space to any one factor in commerce, and this book will make admirable supplementary reading in the higher commercial courses of the schools. The map displays the meaning of much well-collated material, but by methods showing that some map houses still linger in the primitive era of cartographic technique.

The Bontoc Igorot. By Albert Ernest Jenks, Department of the Interior. Ethnological Survey Publications, Vol. I. 266 pp., 154 Plates of Photographs, and Sketch Maps, 9 Figures in the Text, and Index. Bureau of Public Printing, Manila, 1905.

This is the first of a series of scientific studies to be issued by the Ethnological Survey for the Philippine Islands. It was decided that the Igorots of Bontoc pueblo, in the province of Lepanto-Bontoc, northern Luzon, are as typical of the primitive mountain agriculturist of Luzon as any group visited; accordingly, Mr. and Mrs. Jenks lived five months among them in the early part of 1903, collecting the information contained in this large monograph.

Their pueblo or village contains from 2,000 to 2,500 inhabitants, and is only one among many pueblos scattered among the mountains. There are from 150,000 to 225,000 Igorots in Igorot land, and the name means "mountain people." They are practically unmodified by modern culture and are constant head-hunters. There are some differences in their culture which distinguish one group of the people from another. The inhabitants of Bontoc, for example, have not developed the headman, who, immediately north of the Bontoc area, in Tinglayan, is the pueblo leader. The control of the pueblos of the Bontoc area is in the hands of groups of old men.

Mr. Jenks enters with much thoroughness and detail into the discussion of the traits, customs, and conditions of the group among which he lived. There are 22 subdivisions in his chapter on their general social life and 61 in his chapter on their economic life. He gives long chapters to their political and æsthetic life, religion, war and head-hunting, mental and physical characteristics, folk-tales, and language. The large and excellent photographs show many typical aspects of the country—the

men, women and children, individuals or groups engaged in their various labours, their dances, tattoo-marks, implements, etc.

The crude sketch maps show that the Philippines are still largely a virgin field for the surveyor and cartographer. On the whole, Mr. Jenks' impressions of the Bontoc Igorot are very favourable. He is remarkably industrious for a primitive man, is usually faithful to his one wife, is not a drunkard or a gambler, and though his chief recreation is head-hunting, it is not the passion with him that it is with many Malay peoples. The school boys are quick and bright, and Mr. Jenks believes in the future development of these people, who are decidedly friendly to the American, who are willing to learn, and whose institutions are not radically opposed to modern civilization.

New Voyages to North America. By the Baron de Lahontan. Reprinted from the English edition of 1703, with facsimiles of original title-pages, maps, and illustrations, and the addition of Introduction, Notes, and Index by Reuben Gold Thwaites. In Two Volumes. Vol. I, xciii and 407 pp., 5 Maps and 8 other Illustrations; Vol. II, vii and 386 pp., 11 Illustrations, an Appendix containing some New Voyages to Portugal and Denmark, a Dictionary of the Algonkin Language and Index. A. C. McClurg & Co., Chicago, 1905.

It is not surprising that Lahontan's volumes had great vogue in Europe and were published in its five leading languages. They appeared at the dawn of the eighteenth century, when half the New World was still white on the maps and every recital of fresh adventure and discovery only whetted the appetite for more information; and here came the narrative of a Frenchman of noble family who had long lived among these new scenes and loved them, and who had the art of telling simply what he had seen and of drawing word-pictures of the life in the wilderness and of the manners and customs of the aborigines, whose mastery in their realm was now disputed by the white invader.

Lahontan also had other qualities that gave his book a piquant and original flavour. There was no danger of mistaking it for one of the Jesuit Relations. He had a caustic wit, a gift for ridicule, and a grievance; and he called especial attention to the weak points in some of the ways and institutions of the Old World. He even found American savages superior in many respects to the Jesuit missionary and to European society. His satire was entertaining, and did not detract from the value of his keen and usually accurate descriptions of the geography, ethnology, and natural history of New France.

But all the really good material he presented came, in time, to be neglected by writers on the New World because his story of Long River and its discovery was false. There are many theories as to the reasons that may have induced Lahontan to tell this story. It need be said here only that fortune had not dealt kindly with him, and this fact partly explains, if it cannot excuse, his conduct. The penalty was severe, for he was long discredited. But many students of the early history and exploration of North America undoubtedly agree with the opinion expressed by Dr. Thwaites, that "Lahontan's work stands as one of the important sources for the intimate study of New France."

A desirable feature of the book is the Lahontan Bibliography, compiled by Mr. Victor Hugo Paltsits of the Lenox Branch of the New York Public Library. Mr. Thwaites's introduction gives so clear an insight into the character and circumstances of the author that no one need fail to read the book with intelligent interest. The notes are also copious and informing.